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THE

LECTURES

OF

BOYER,

UPON

DISEASES OF THE BONES:

ARRANGED INTO A

SYSTEMATIC TREATISE

BY A. RICHERAND,

PROFESSOR OF ANATOMY AND PHILOSOPHY, AND PRINCIPAL
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TRANSLATED FROM THE FRENCH BY

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CHAPTER I.

OF RICKETS.

This disease is most generally met with in young children, and but very seldom in adults; however, persons that have suffered from it in their youth, may be attacked with it after puberty. The memorable case given by Morand in the Memoirs of the Academy of Sciences, 1753, furnishes a remarkable instance of its attack after this period of life.

The bones of the fœtus whilst in the womb may be affected by it: Pinel has given, in Fourcroy's Journal, a description of the skeleton of a ricketty fœtus. But it most generally manifests itself from the sixth or seventh month, to the fourteenth or fifteenth, or much about the period of the first dentition. J. L. Petit, and many others, have considered difficult cutting of the teeth as a principal cause of it.

It is not as yet decided whether this disease, the characteristic mark of which is a softening of the bones from a deficiency of phosphate of lime, be a primary affection, or a symptom of scrofula, lues, or scurvy: Doctor Portal maintains the latter opinion.

We will observe, however, that there seems to be a great connexion between rickets and scrofula: the swelling of the mesenteric glands, the colour of the skin, the flaccidity of the muscles, and other symptoms observed in rickets, are marks of a scrofulous diathesis.

Whatever may be its cause, its progress is as follows: the child generally suffers from cutting his teeth, and is tormented for some time by a continual diarrhœa; at length the belly swells, and becomes hard and tense; the skin is now dry and scaly; the limbs diminish in thickness, and the whole body becomes emaciated; the ends of the bones swell, and the joints of the extremities appear like so many knots; the bones lose their consistence, or become flexible, and the muscular substance decays. The patient, reduced to this miserable state, is incapable of moving, and every effort he makes, or even the weight of his body, bends the bones. The head preserves, however, its natural size, and in most cases becomes even larger than natural. The brain, which does not seem to share in the general dissolution, becomes evolved, its extension not being opposed by the softened bones in which it is included, and the understanding is prematurely developed. The eyes have an uncommon brilliancy, and all the senses are extremely acute: however, cases have been met in which great marks of stupidity or dulness accompanied the disease.

The affection does not always stop here; sometimes the bones become carious, or a white swelling appears in some of the joints; either of which in general proves fatal.

The vertebral column is particularly liable to be affected by rickets, and the disease is sometimes confined to it alone. When the cervical

vertebræ

vertebræ are attacked, the anterior part of the neck projects, and the head falls backwards, and appears sunk between the shoulders. When the affection is general, the vertebral column becomes shorter, and is curved in various directions; the breast becomes deformed, not only in consequence of the curvature of the spine, but by the depression of the ribs and projection of the sternum; the bones of the pelvis fall inwards, and generally the pubis approaches the sacrum; and the diameters of the pelvis are so much diminished, that parturition must be rendered difficult or impossible. However, some women deformed by rickets, bring forth full-grown children, without any difficulty; but I believe that in such cases the rickets come on after puberty, at which time there is much less danger of the pelvis being affected than in infancy.

The curvature of the clavicles increases, and becomes more prominent anteriorly; the scapulæ grow shorter; the humeri become curved outward towards their superior part, whilst their inferior is carried forwards; the bones of the forearms are curved in the same manner; but the superior extremities, as they do not support any part of the weight of the body, are always much less deformed than the inferior, and they are always bent towards that side into which the most powerful muscles are inserted.

The bones of the thighs are curved forwards or outwards, the anterior and external parts of the thigh becoming more prominent; the neck of the femur, from being oblique, becomes perpendicular with the body of the bone; the knees fall inwards; the internal and anterior sides of the tibia become convex, and the external side of the legs concave; the feet are thrown outwards, not only on account of the knees falling in, but also because the inferior end of the fibula cannot sufficiently oppose the abduction of the foot.

Nothing certain has been ascertained as to the proximate cause of rickets; conjectures however have not been wanting on this subject. Some have supposed that the bones are deprived of their phosphate by an acid; but what acid is this? How is it generated? Does the acid smell of the breath of the ricketty patient indicate any thing respecting it?

Is the softening of the bones owing to a defect of reparation, while their ordinary loss is going on? or is there a disease in the bones by which they are decomposed and consumed, whilst the digestive organs do not furnish a sufficient supply of calcareous phosphate? or is the passage of this salt from the chylopoetic viscera prevented by the obstruction of the mesenteric glands? We must acknowledge that ricketty patients, notwithstanding their voracious appetite, appear to digest their food but badly, and that the passage of the chyle must be impeded by the obstruction of the mesenteric glands, in which calcareous concretions have been found: lastly, does the chyle contain a less quantity of phosphate of lime than natural? or does this salt, instead of being deposited in the bones, pass to other parts? and what is the cause of this deviation?

If the body be anatomically inspected after death, the parts will be found in the following state:

The muscles are pale and emaciated; the cellular substance is quite destitute of fat; the brain is in general found larger than natural, soft, and containing a preternatural portion of humidity; the spleen and liver are flaccid and enlarged; the intestines are pale, or rather whitish; all the lymphatic glands, especially those of the mesentery and bronchiæ, are enlarged, and the latter sometimes suppurated; the bones, reduced to their fibrous state, are flexible, bent in several directions, and easily cut.

There have been various opinions as to the cause of the curvature of the bones. Glisson, who wrote towards the middle of the seventeenth century, is the first who expressly treated of rickets: his explanation of the curvature is as follows:

The humours, says he, that go to nourish the bones, are accumulated more on one side than on the other, and thus curve the bone, or make it incline to the opposite side, in the same manner as a column might be curved by introducing in the same line, and on the same side, wedges between its different parts. But how is it proved that the humours are deposited in one side in preference to another? and how comes it that the curvature takes place in most persons in the same direction?

Mayow, an English author, gives the following hypothesis; the tendons being dry and shortened, oppose the elongation of the bones, and bend them in the same way as a young tree is bent, by bringing both its ends towards one another against it; and even in the most favourable cases it is impossible to guard against deformity. However, the danger to life is great in proportion to the number of bones affected, the more or less speedy progress of the disease, and the age of the patient. Children at the breast are in greater danger than those that have reached three or four years. If the bones about the thorax be considerably affected, the cavity is diminished, the lungs are compressed, the function of respiration goes on imperfectly, and hence a number of diseases which are fatal of themselves.

Sometimes the disease advances but slowly, and the patient arrives at puberty before he is quite well; but the great revolution that takes place in his system at this time, arrests the progress of the complaint. Measles, small-pox, and other diseases to which children are subject, have sometimes brought about this happy termination: the limbs recovered their size, the enlargement of the joints disappeared, and no mark of rickets remained but the deformity.

We know of no medicine which can be said to possess any efficacy in this disease: tonics are indicated, and they should be used. But the principal advantage is to be derived from general treatment: the patient, if resident in a city, is to be removed to the country, where an elevated and dry situation should be chosen; he is to be supplied with a nourishing diet, and a moderate quantity of wine. But as the poor, among whom the disease is most frequently observed, cannot change their residence, they should be placed in the highest apartment of the house, which should be kept well ventilated; and in the warm season the patient, covered with a shirt, should be exposed for a considerable time every day to the sun: care, however, should be taken that his head be protected against the influence of the rays.

The bed on which ricketty patients lie, should consist of nothing more than a hair mattress, or oaten chaff; or it might be made of dried fern-leaves, among which some aromatic herbs were mixed. Such beds are much better than those made of feathers; for they do not yield to the weight of the body, and they are much drier. If the patient be very young, he should be placed on his back, so that the weight of his body may have as little influence as possible on the bones; but as it is painful to remain constantly in this position, he may be allowed to sit up now and then, but not on a soft chair: he is to be placed on a seat capable of making a uniform resistance, with a high straight back, and without arms. If the seat were soft, the patient, to find a *point d'appui*, would incline forwards; and if it had arms, were he to lean on them, his shoulders would be raised, and the cervical vertebræ curved forwards. He should not be allowed to walk for a considerable time; for at first he will be incapable of doing so without assistance, and the strings and ribands necessary for supporting him, contribute, by pressing on the parietes of the thorax, to deform that cavity.

Frictions are useful. They may be made either with dry flannel, impregnated with aromatic vapours, or with flannel wet with mint, rosemary, lavender, or other aromatic waters. A hair brush, much used by the English, is an excellent instrument for this purpose. Frictions determine the fluids to the surface of the body, promote perspiration, and increase the circulation.

The clothing should be wide, and composed of materials which are light, and which do not transmit freely the heat of the body. If the patient be a child at the breast, the nurse's qualities should be inquired into; if she is feeble, unhealthy, or pregnant, the child should be committed to another nurse, possessing the very opposite qualities. If the child be weaned, he is to be nourished with well-fermented bread, and animal food simply roasted; and wine is to be allowed him in small quantities, often repeated. As to exercise, if it do not increase the curvature of the bones, as much of it should be taken as will not fatigue the patient; and when the softness of the bones is such that any exercise which would require considerable muscular action cannot be used, riding in a carriage, or sailing, should be had recourse to.

Independently of the general means just pointed out, there are particular remedies which may be used in cases to which they are adapted.

If the patient suffer from dentition, that is, if he be tormented with griping pains and diarrhœa, or if he shriek severely now and then, and have convulsive twitches, opium should be given. If he be troubled with worms, rhubarb and other supposed vermifuge medicines may be administered.

It is very common to find ricketty patients troubled with worms: the weakness of the alimentary canal, and the quantity of mucus collected in it, favour the generation of worms, the existence of which in the intestines is indicated by colic pains, itching of the nose, acidity of the breath and perspiration, dilatation of the pupil, &c. &c.

We may endeavour to discuss the swelling of the mesenteric glands, by small doses of infusion of rhubarb, and by repeated frictions on the abdomen. I am confident that much benefit might be derived in these cases from making the patient laugh heartily every day, by tickling him: in this convulsive motion, the organs contained in the cavities of the thorax and abdomen are agitated and pressed in every direction, and the motion of the fluids in their small vessels is accelerated.

If it appear that syphilis or scrofula has had any share in producing the rickets, the treatment applicable to each of these diseases should be had recourse to. In case of a venereal taint being the cause, tonics should be combined with the use of mercurials; for the latter, by inducing debility, accelerate the progress of the rickets.

The knowledge of the cause of the softening of the bones, necessarily leads to endeavours to obviate it, or repair the injuries it occasions. But, how are we to introduce a sufficiency of phosphate of lime? How are we to stimulate the absorbents, and make them take up a greater portion of this salt? And, supposing that this could be effected, how can we cause it to be deposited in the bones? Madder, from its known property of tinging the bones red, was supposed to have a particular action on the osseous system; but it is now well ascertained that it has no greater effect in rickets than any other bitter plant.

Thus it appears that our chief object in treating this disease, is to restore general health and strength as much as in our power: the general treatment already pointed out, is what is most to be depended on for this purpose, but it may be assisted by the use of bark and other tonic medicines.

Mechanical means have been proposed for obviating the effects of this disease. It is nearly useless to attempt using any machines with very young children, and it is also impossible to confine them on their back in bed; besides, it would be extremely injurious to keep them confined in this posture: the continued extension of the limbs, and the inactivity of the muscles, would add to the general debility, and consequently increase the disease. Splints, then, applied to the limbs, strong leather boots, and the apparatus for the spine, are really useful only in cases in which the patient is of a certain age, and when the progress of the disease is gradual, and the strength not too much exhausted; and even in most of these cases, the inactivity necessarily occasioned by these machines, is productive of disadvantages which are not compensated by their good effects. Apparatus of this kind are fitter for correcting vicious attitudes contracted by healthy children, than deformity arising from rickets.

CHAPTER II.

OF THE FRAGILITY OF BONES.

We have seen that a softening of the bones may be produced by a deficiency of phosphate of lime: we shall now consider a disease of an opposite character, which consists in a deficiency of the gelatinous part. This substance, to which bones owe their flexibility, and in which their vitality resides, may be so deficient in them, that they will break on the application of very slight causes. This disease has been called friability, or fragility, from the tendency of the bone to crumble or fall in pieces. The state of the bone, in this case, may be well conceived from that of a calcined bone.

This affection is a natural consequence of old age. The proportion of phosphate of lime deposited in the osseous tissue, increases as we advance in life, and that of the organized part diminishes in a similar proportion; so that a period arrives at which the quantity of the former so much predominates, that the bones, dead as it were before life abandons the other parts, break on the slightest occasions.

The disease at this period of life is necessarily incurable. If the fractures be reduced, and an apparatus kept applied on the limb for several months, no progress towards consolidation is observed. Tonics and stimulants are of no use. There are so few vessels in the bones capable of conveying fluids, that no granulation forms.

A similar fragility of the bones is observed in adults; but in them it arises from a venereal, scrofulous, or cancerous taint.

When the whole mass of fluids is infected with the matter of cancer, it sometimes happens that this virus attacks the bones, destroys their vital parts, and renders them as brittle as if they had been calcined. Saviard and Louis mention cases of this kind. The latter relates the case of a nun who attended *La Salpêtriere*, who broke her arm by simply leaning on a servant as she was entering a carriage. A very singular case of this kind is related in the

London Medical Journal; this unfortunate person could not turn in bed without fracturing some bone.

This alarming symptom is completely irremediable when it arrives at this stage.

The bones are sometimes remarkably brittle in the latter stages of syphilis. In such cases the primary disease claims our chief attention.

The bones in the latter stages of scurvy become so brittle, that they break on slight occasions, and do not consolidate afterwards. Mead observed, that scurvy was very unfavourable to the consolidation of fractures, and that in some cases of sailors which he observed, the callus was destroyed by scurvy after it had been formed.

If the bones of a scorbutic person be boiled, the periosteum separates very soon, lamellæ scale off, and, in some cases, the bone dissolves entirely. They also fall into powder if kept for some time, but particularly if exposed alternately to heat and moisture.

We may conclude from the preceding observations, that fragility is rather a symptom of senility, or of some disease that affects the bones, by destroying their organic parts, than a primary disease. We should not have consigned a chapter to it, did we not hope that the etiology of rickets may in time be elucidated by a comparison of these two affections.

CHAPTER III.

OF SPRAINS.

SPRAIN may be defined, a more or less violent tension of the ligaments and other soft parts surrounding an articulation: the tension may be carried so far as to burst and lacerate many of the ligaments. All the articulations are not equally liable to this accident; those which admit of an extensive and free motion, all the round or loose articulations, in which the bone moves in a variety of directions, as the articulation of the os humeri with the scapula, and that of the femur with the ossa innominata, are very little subject to it. The latitude of motion they admit of, the small number, laxity, and particular structure of their ligaments, render them more liable to luxations from inconsiderable efforts, than to sprains. In the articulations by ginglymus, on the contrary, in which the motion is confined to two ways by the reciprocal conformation of the surfaces of the joint, and by strong and numerous ligaments, sprains take place oftener than luxations. Of this kind of articulation is that of the foot with the leg, in which the astragalus, received like a tenon into a quadrangular cavity, is surrounded on all sides by very strong ligaments. Next to the articulation of the foot comes that of the wrist, then those of the knee and elbow, in which a sprain rarely occurs.

The nature of the affection may be thus explained: suppose the foot or hand to be fixed, and the leg or fore-arm pushed forwards in any direction, the ligaments placed on the side against which these parts are forcibly propelled, will be put in a considerable state of tension, and strained; the tension may be carried so far as to lacerate the ligaments, of which there have been many instances. The tendons, and other soft parts, such as the nerves, vessels, and even the skin, are overstretched and pained. Those parts placed on the side towards which the displaced bone tends, are more or less injured in the angle which intercepts the luxated bones: they experience a contusion, by which the small vessels are bruised and lacerated, and a considerable ecchymosis produced. The tension to which the parts of the joints are subjected in sprains, is not then confined to the ligaments alone, it extends to all the parts in the neighbourhood; this gives an explanation of the sharp pains that accompany them, and of the inflammatory swelling which succeeds. In fact, although ligaments are endowed with a peculiar kind of sensibility, which renders the extension of them painful, nevertheless they do not possess a sensibility so exquisite as that the irritation of them alone could cause so much pain, and such a considerable inflammatory determination, as that frequently occasioned by a sprain.

A sprain, then, in the moment of its production or taking place, consists only of the tension, and sometimes laceration of the soft parts surrounding an articulation; but the pain which arises from it, quickly determines the fluids to the irritated part; a swelling more or less considerable supervenes; the skin often appears black, livid, and spotted, from the infiltration of the blood which escapes from the ruptured vessels into the cellular texture.

When both parts of the affected articulation are formed of many bones, it may happen that the ligaments which unite them may be torn, and the extremities of the articulations disjointed and separated from one another. This diastasis has been observed in the inferior extremities of the tibia and fibula, in those of the radius and ulna.

When the sprain is slight, the pain produced by it gradually diminishes, the swelling is resolved, the ecchymosis extends and disappears, the motion of the parts becomes easy, and at the end of some days the articulation is restored to its natural state. Nevertheless, if the sprain has been considerable, and especially if very strong ligaments, such as the internal ligaments of the articulation of the foot with the leg, have been partially or entirely torn, nature requires a considerable time to unite the divided parts; the joint with difficulty acquires strength, and a feebleness remains in it, which disposes it to the same accident.

A sprain is easily distinguished by attending to the history of the circumstances relating to it, such as a fall or false step, in which the foot or wrist, as the vulgar say, has been more or less wrenched. The state of the articulation that has suffered, ought however to be attentively examined, in order to discover if the ligaments have been lacerated, or if a dislocation of the extremities of the joint be combined with the sprain. When the parts admit of motion in every direction, however difficult and painful it may be, we conclude that a simple sprain, and not luxation, has taken place.

The prognosis is unfavourable, in proportion as the extension and laceration have been considerable. In scrofulous persons sprains are very dangerous, because they often give rise to white swellings.

The treatment of sprains varies according to the continuance of the affection. Should the surgeon be called in on the moment that the sprain has taken place, he should endeavour to prevent the effects of the irritation caused in the strained joint. For this purpose, the diseased part is to be plunged into cold water, or still better into powdered ice. The brisk impression occasioned by the cold, constricts all the parts, and diminishes the diameter of all the small vessels, so much, as to prevent the admission of the blood determined to them by the irritation. Besides, the extreme cold, by diminishing sensibility, abates the irritation itself, and thus in two ways prevents the influx of fluids. But to derive from refrigerants all the advantages that may be expected,

pected, it is not enough to leave the diseased part exposed to them for half an hour, or even an hour; it must remain immersed in them during several hours, and they must be renewed as they acquire heat, so that their action, at once repellent and sedative, may preserve the same energy. These means, if not continued for a certain length of time, far from being useful, do an injury, by exciting a reaction which determines the humours to the part where the irritation had already too powerfully invited them. Should a woman have her menses when this accident happens, these means could not be had recourse to; the immersion in cold water would almost infallibly suppress the menstrual discharge, and induce a disease more grievous than the sprain itself. The same would be the case should we have to treat a person with delicate lungs. When the part is removed from the ice, it must be covered with cloths soaked in cold liquids, such as vegeto-mineral water, spirit in which camphor or sal ammoniac has been dissolved, a mixture of vinegar and water, &c. with which the part is to be continually moistened. By a treatment of this kind, a violent sprain often produces only a very moderate swelling, and the disagreeable consequences are never completely developed.

It is scarcely necessary to condemn here the absurd practice of ignorant bone-setters, who agitate, twist, and press the affected joint in every direction, or advise the patient to roll a cylinder of wood under the sole of the diseased foot. The repellent mode of treatment can be successful only shortly after the accident has taken place; at the end of twelve hours, the irritation which has not been subdued, and the effects of which have not been prevented, has already produced an influx of humours, with swelling, pain, and inflammatory tension of the adjacent parts. It then becomes necessary to take a quantity of blood proportioned to the age and temperament of the patient, the degree of the sprain, and severity of the symptoms.

Emollient cataplasms are applied, with the view of relaxing the solids, and of abating irritation; the use of them is to be continued as long as the inflammatory tension and pain are present; but when the swelling begins to be resolved, which change is announced by the subsiding of the tumour, the wrinkling of the skin, the extension of the ecchymosis over the limb, which becomes yellow, resolvents are to be combined with the emollients: for this purpose a poultice a poultice composed of crumbs of bread and linseed meal boiled in wine, or in a strong decoction of elder-flowers, is applied; the cataplasms are to be rendered more and more resolvent, and towards the end of the complaint, resolvents only are to be used: lastly, solvents, such as styrax-plaster, sprinkled over with the flowers of sulphur, &c. &c. are to be substituted for them, and pumpings with water in which some sulphuret of potash has been dissolved, or with natural or artificial warm waters, are to be prescribed.

The diseased part must be kept in a total state of inaction for as long time as possible, and the limb preserved in the horizontal posture, which favours the subsiding of the tumour, by facilitating the return of the fluids. The patient should not be allowed to walk, or make use of his wrist, until the pain has entirely vanished; he should even be informed that the pains will return, and be felt at intervals for six months or a year, and also advised not to fatigue too much the weak joint. A roller is to be firmly passed round the foot and leg: by this precaution the œdematous swelling of the limb will be prevented, which, without it, would inevitably take place. This treatment is indispensably necessary,

cessary, when the sprain is accompanied with a complete or incomplete rupture of some ligament, and with the separation or diastasis of the ends of the joint, a complication which renders the case more serious, and the cure more tedious and difficult.

If the sprain be badly treated, or if the patient use the affected joint before all the symptoms entirely disappear, some swelling still remains in the part; soon, in consequence of some stress, the pains that were only lulled, reappear, the swelling increases, but in a slow manner, and assumes the appearance rather of an indolent than inflammatory tumour, being very hard and without any change of colour in the skin; and in time it extends to all the ligaments and soft parts in the neighbourhood of the joint. The healthiest and most robust persons may have tumours of this kind supervene, as the consequence of ill-treated sprains. Nevertheless it is certain, that the existence of a scrofulous diathesis gives a strong predisposition to them: in this latter case, the sprain may be considered the exciting cause of the disease, which attacks an enfeebled and pained part predisposed to it. However, sprains that have been neglected, often render amputation necessary, on account of the enlargement and caries of the bones that succeed to them.

It may suffice for us to say, without giving the particulars of numerous instances of this melancholy termination, that sprain, an affection so trifling in the eyes of the vulgar, is one of the most frequent causes of diseases of the joints, which, in civil hospitals, render amputation necessary.

The rules to be followed in the treatment of the bad symptoms succeeding to sprains, will be given in the chapter on white swellings. To give them here, would put us under the necessity of making useless repetitions.

CHAPTER IV.

OF LUXATIONS IN GENERAL.

LUXATION takes place every time that the articular extremities of bones abandon their natural relations, whether it be that the head of a bone escapes from a cavity destined to receive it, or that the surfaces of the joint cease to correspond one to the other. The dislocation may be either total or partial: hence luxations are divided into complete and incomplete.

In order to consider the nature of luxations, a previous knowledge of the anatomy of the articulations, and of the different modes of the junction of bones, is necessary. Thus, to form a just idea of the different kinds of luxation of which the bone is susceptible, of the manner in which it takes place, to understand perfectly its symptoms, easily seize the indications of cure, and make choice of the proper means of fulfilling them, the particular conformation, and mutual or reciprocal relation of the surfaces by which the bones come in contact, and are articulated,

culated, must be previously known. These relations should be learnt on fresh bones covered with their cartilages, and having their cavities furnished with the cartilaginous borders which increase their depth, and with the synovial glands which furnish the liquor by which they are moistened.

It is equally necessary to have correct notions of the muscles surrounding the articulation; of the vessels and nerves in its vicinity; of the motions of which the joint is capable, and the changes which the soft parts and bony prominences undergo when these movements are executed.

After having acquired this information, it is necessary to know that luxations, as well as fractures, present characters which are general and common to all luxations, and objects which are peculiar and confined to each species.

SECTION I.

Of the Differences of Luxations.

Luxations, taken in a general point of view, differ from one another, 1. with respect to the articulation in which they take place; 2. the extent of the dislocation; 3. the direction in which the bone is displaced; 4. the length of time they have continued; 5. the circumstances which accompany them, and which mark them out as simple or compound; 6. and lastly, with respect to the cause that has produced them.

The extent and variety of motion a joint admits of, give the measure of the tendency of the bones composing it to be luxated. Thus, the round or loose articulations, such as that of the humerus with the scapula, are those in which luxations are most frequent; in the ginglymoidal articulations, on the contrary, which admit only of motion in two opposite directions, they are very rare. The frequency of luxations in the orbicular articulations, and the unfrequency of them in the ginglymoidal, may be explained from many circumstances independent of the greater or less motion they admit of. In the ginglymoidal, the surfaces of the extremities of the bones which come in contact, and are adapted to one another, are of considerable extent; and when a foreign power acts on them, and forces them in contrary directions, they have to describe a great space before dislocation takes place; the ligaments which surround them are very numerous and strong, and the muscles placed on their sides are disposed in a manner to prevent their derangement.

With respect to the extent of the dislocation, luxations are distinguished into complete and incomplete: the latter denomination is given them when the surfaces of the joint are yet in contact by some points of its cartilages, without being entirely displaced, but at the same time not exactly corresponding. Incomplete luxations take place only in the articulations by ginglymus, as in those of the foot, the knee, and the elbow. When complete dislocation takes place in these parts, the force that has effected it must have been very great; thus luxation in them is almost always incomplete. The same is not the case with the orbicular articulations, the greater number of which are susceptible of no other luxation than the complete.

If the head of the humerus or femur is forced on the cartilaginous brim that surrounds and deepens the cavity destined to receive it, the osseous ball, covered with cartilage, and having its surface smooth and lubricated, comes in contact with the parts on which it rests by only a very few points, and thus either re-enters the cavity it has abandoned, or escapes entirely out of it: in the latter case the luxation is complete.

There are some articulations, which, though truly orbicular, may nevertheless admit of incomplete luxations. For instance, the head of the astragalus may be so displaced as only to abandon in a partial manner the cavity in the posterior face of the os naviculare; but in this case the orbicular ligament is tight, very strong, and the motion inconsiderable. In considering fractures in general, we have seen that they could not, like luxations, be distinguished into complete and incomplete, the latter denomination not being adapted to a solution of continuity in one of the bones of the leg and fore-arm. We shall see, in treating of luxations of the lower jaw, that some, on a principle somewhat similar, but equally erroneous, have wished to call incomplete that in which only one of the processes of the maxilla is displaced from the glenoid cavity of the os temporis. Lastly, to conclude what relates to the extent of the dislocation, when the head of the bone has entirely escaped from its cavity, it may still be forced to a greater or less distance between the interstices of the muscles.

As to the different directions in which a bone may be displaced: in the round articulations it may be luxated in the direction of all the radii that pass from the centre of the circle formed by the circumference of the articular cavity. There is not, in fact, a point of the edge of the glenoid cavity, by which the humerus may not escape. Nevertheless, as shall be explained when we treat of particular luxations, various circumstances depending on conformation cause the luxation to take place in certain directions ascertained by observation, so that the varieties of luxations distinguished by the course of the displaced bone are much less numerous than might at first be supposed. Luxations are named superior, inferior, anterior, posterior, &c. according to the approximation of the bone to these directions. With respect to the ginglymoidal articulations, which, as we have seen, constitute a class entirely different from the orbicular, considered in what relates to their luxations as well as their motions, the bones which form them describe two lines, during their luxation, which cross one another at right angles; the first by passing from one side to the other, the second from the anterior to the posterior part.

The continuance of luxations constitutes a difference of the highest importance, and influences considerably the manner of treating them. In fact, the reduction of a luxated bone which has remained so for several days, is much more difficult than that of one more recently displaced.

The soft parts, and the bone itself, have acquired a certain position, and the ligaments and muscles surrounding the diseased joint become stiff, and difficultly yield to the efforts made to reduce the bone. If a certain number of days have elapsed, the laceration in the ligaments may be so far cicatrized as to render the reduction impossible. Lastly, the extremities of the joint may be grown to the bones against which they have been forced,

A luxation may be simple, that is to say, consist only of the reciprocal abandoning of the surfaces of the joint, and the laceration of the ligaments which is inseparable from it: it may be complicated with greater or less contusion, with a wound, fracture, or rupture of a blood-vessel, and consequently an effusion of blood into the cellular substance, with contusion of a considerable nerve, and a paralysis of the organs to which it is distributed, &c. &c.

SECTION II.

Of the Causes of Luxations.

THE causes may be divided into external and internal: both are predisposing or occasional.

The predisposition to luxation may depend on circumstances natural or accidental. The natural are, the joint admitting of great latitude of motion, the small extent of surfaces by which the bones come in contact, the laxity and small number of the ligaments uniting them, the weakness of one side of an articulation, arising, for instance, from a great notch on one side, as is observed in the interior and inferior part of the acetabulum. Disease, such as a paralysis of the muscles which surround an articulation, a debility and relaxation of its ligaments, give also a predisposition. In a paralysis of the deltoid muscle, the weight of the arm alone has been known to occasion an elongation and gradual relaxation of the round ligament of the articulation of the humerus with the scapula, and remove the head of the former bone to the distance of two or three inches from the glenoid cavity. I have observed in a child, who laboured under an atrophia of the muscles of the arm, an empty space of nearly an inch between the head of the bone and the surface of the cavity, which could be distinctly felt through the emaciated deltoid muscle.

Sometimes the relaxation of the ligaments appears without any evident cause, and gives such a disposition to luxations, that they take place from the slightest causes: such was the case of a woman, who could not yawn even moderately without luxating the lower jaw. It may not be amiss to observe, that these luxations, depending on the excessive relaxation of the ligaments, are, on account of the relaxation itself, very easily reduced.

A swelling or distention of the cartilages of the joints and caries of the bones, may also dispose to luxations; but in these cases, the affection of the cartilages and the caries constitute a particular and primary disease. Luxation is to be considered then only as an additional symptom; and it is perhaps without foundation, as shall be mentioned in the chapter on spontaneous luxations of the femur, that authors

thors have ranked this disease of the hip among these affections.

In order that external violence, a blow, a fall, or even the action of the muscles, produce luxation in a round articulation, the axis of the bone must be placed in a direction more or less oblique with respect to the surface with which it is articulated. If, for example, the os humeri hang exactly along the sides of the body, or perpendicularly with respect to the glenoid cavity of the scapula, no force is capable of luxating it. If a person fall on the elbow while the fore-arm is in this position, the head of the humerus will be forced against the cavity formed to receive it; but if the arm be removed from the body, the axis of the os humeri will fall obliquely on the surface of the glenoid cavity, which will favour its passing out of the socket; and this disposition to luxate will be increased in proportion as the angle formed by the axis of the bone with the surface of the cavity deviates from a right angle.

A fall, or any other kind of external violence, may cause a luxation almost always incomplete in the ginglymoidal articulations; but in the round articulations, the action of the muscles has constantly a share. Thus, for instance, if a person fall on the elbow whilst the arm is raised from the body and carried directly outwards, the shock which this part receives will certainly tend very much to force the head of the humerus out of its cavity on the lower and internal side; but the action of the pectoralis major, latissimus dorsi, and teres major, contributes very much to it. In fact, the elbow, resting on the ground, becomes the fulcrum, or centre of motion of the humerus; in this state we obey a mechanical instinct, which leads us suddenly to bring the arm close to the body; and as the resistance made by the ground prevents this, the violent and instantaneous contraction of the pectoralis major, latissimus dorsi, and teres major, draws downwards and inwards the head of the humerus, the luxation of which is, as we have demonstrated, the effect of two causes.

In this instance, we have seen how muscular action conduces to luxations in the round articulations; in some cases, this action alone is sufficient to effect them. It is in this way that violent convulsions produce luxations as well as fractures.

Whatever may be the manner in which the causes act, luxations are always accompanied with more or less laceration of the ligaments surrounding the joint; and in the round articulations, as those of the shoulder and hip, the fibrous capsules are always torn.

SECTION III.

Of the Symptoms of Luxation.

We will not mention pain and inability of moving the limb, as they are equivocal symptoms, and common to luxations, fractures, and simple contusion. They are not, however, to be entirely overlooked; but when we make a diagnosis, we should endeavour to found it on the existence of symptoms manifest to the senses, such as an elongation or shortening of the limb, a change in its shape and direction, and lastly, the absolute impossibility of performing certain motions. We will say little on the manner of ascertaining the existence of these different symptoms, as we have already spoken of it in giving the general history of fractures.

A luxation cannot possibly exist without the affected limb being either lengthened, as happens in the inferior extremity, when the head of the femur passes out downwards and inwards, and rests in the foramen ovale, or shortened, as takes place when the same bone is luxated upwards and backwards, and has its superior extremity directed towards the external depression in the ilium. In truth, the shortening or elongation is rarely observed but in the orbicular articulations; however, the absence of these symptoms in the ginglymoidal is amply compensated by the superficial situation of the bones, which renders it easy to ascertain their relative positions.

The direction of the bone is changed; for the luxated end cannot leave its natural place without having the other carried in a direction contrary to it. Thus, in the luxation of the humerus downwards and inwards, the arm is placed obliquely downwards and outwards, instead of falling straight along the side. This symptom, taken from the direction of the member, is, like many others, much easier to be distinguished in recent luxations than in those that have continued for a considerable time. From the change of situation and direction of the bone, there must necessarily result a relaxation of some muscles, whilst others are considerably overstretched and strained, as may be seen with respect to the deltoid muscle in cases of luxations of the humerus, which are the most frequent. This unequal and unnatural tension and relaxation of the muscles may contribute also in aiding us to form a diagnosis in cases of luxation.

The change in the shape of the limb is also removed by time. In fact, one would presume, from the manner in which the shape of the point of the shoulder is restored after a luxation of the humerus by a projection of bone arising from the convex edge of the acromion, that the head of the os humeri was not forced into the axilla. In these alterations of the natural shape of the limbs, we are to comprehend the changed relations of the eminences of a joint to one another, the existence of projections in places where the limb should present depressions, and depressions where it should present eminences. In the luxation of the arm inwards and downwards, a hard tumour is felt in the axilla, which, on account of its roundness, is easily ascertained to be this part of the bone.

Our limbs, even when fractured, may be made to perform several motions, and be put in various attitudes. In a fracture of the femur, the surgeon, not in truth without causing more or less pain to the patient, may, by taking hold of the leg, move it round in a circular direction, and may point the foot inwards and outwards—motions altogether impossible in luxations, before the reduction of the displaced bone.

By combining all these symptoms, it is impossible to form a wrong diagnosis in cases of luxation. A mistake would be extremely dangerous; for if the luxation be not discovered, the patient attributes his not being able to use his limb to the contusion and pain; but if the continuance of the symptoms induce him to have recourse to other persons better instructed or more attentive, they ascertain the nature of the affection, to the no small shame of the surgeon who has mistaken it. Instances of errors of this kind are more frequent than one would imagine, especially in the country, where the branch of surgery which we treat of in this work is often in the hands of ignorant persons.

SECTION IV.

Of the Prognosis in Luxations.

THE luxations which take place in the ginglymoidal articulations, differ much from those in round articulations, in what relates to prognosis, as well as in many other points of view: the latter are much less dangerous than the former. As the action of muscles has a great share in producing them, the violence done to the external parts is less, and the laceration of the soft parts is not so considerable: even in articulations of the same kind, the extent of the evil is measured by the largeness of the surfaces of the joint, the number and strength of the muscles surrounding it, and the thickness and number of its ligaments. It is for these reasons that luxations of the foot and knee are more dangerous than those of the elbow and wrist: the former require a much greater degree of external violence to produce them, in consequence of which the injury done to the soft parts is much greater.

A difficulty in reducing the luxated bone renders the luxation more or less troublesome.

With respect to this point, luxations of the round articulations are more unfavourable than those of the ginglymoidal; those of the femur more than those of the humerus, because the efforts to reduce the former are often counteracted by the action of very powerful muscles.

Luxations arising from a swelling of the cartilages of the joints, from a caries of the bones, or from a relaxation of the ligaments, are always attended by more grievous consequences than those occasioned by external violence. Lastly, a contusion more or less considerable, laceration of vessels, or destruction of the substance of nerves, render the prognosis more or less unfavourable. The latter circumstance occasions a paralysis of the muscles to which the disorganized nerve furnished branches. We have seen, in a luxation of the humerus downwards and inwards, a paralysis of the deltoid muscle produced by the violent contusion of the circumflex nerve, which is chiefly bestowed on that muscle.

SECTION V.

General Treatment of Luxations.

To reduce the luxated bone, keep it in its place, and prevent or remove the symptoms with which the luxation may be complicated, form the three indications which are to be fulfilled in the treatment of luxations. The reduction is accomplished, as in cases of fracture, by three means opposite in their action, but tending to the same end, viz. extension, counter-extension, and coaptation. It is useless to repeat the definition of each of these terms, and in what each of these motions consists.

The reduction of a luxation is the most difficult and important part of the treatment of it. Contrary to what takes place in fractures, which are easily reduced, but difficultly kept so, luxations are hard to reduce; but when the bone is once adjusted, it is easily kept in its place. It will not then be useless to examine minutely all the particulars of this operation; and first, with respect to extension, we will examine in order on what part the apparatus for making it should be applied, the means employed for this purpose, the degree of force to be used, and the direction in which it is to be made.

The extending force should be applied, not on the luxated bone, but on that with which it is articulated, and as far as possible from it. The observance of this precept is still more necessary in luxations than in fractures.

All the ancient authors advised applying the extending force on the luxated bone; for instance, to apply it above the knee in luxations of the femur, and above the elbow in those of the humerus. Many of the moderns have followed their instructions; and this mode is found recommended by J. L. Petit and Duverney, in their Treatises on the Diseases of the Bones. Two members of the Academy of Surgery, Fabre and Dupouy, saw the inconvenience of this practice, and substituted for it a mode of treatment now generally adopted. Their practice, which consists in applying the extending force on the bone that articulates with the luxated one, has two most important advantages: first, the muscles that surround the luxated bone are not compressed, nor stimulated to spasmodic contractions, which would prevent the reduction, not only by opposing a force superior to that employed for the purpose of reduction, but also by retaining the head of the bone engaged in the interstices of the contracted muscles. Secondly, the extending force is much more considerable than can be obtained by the other mode; for, as Dupouy has observed, by elongating thus the arm of the lever, we acquire a degree of power, which the difficulties presented in a great number of cases often force us to have recourse to.

It has been apprehended, it is true, that the extending force applied at a distance from the luxated bone, would lose in the articulations of the limb a part of its effect: thus, it has been said, that a part of the extending force applied at the wrist in a luxation of the humerus, is employed in elongating the ligaments of the elbow joint. But this objection is ill founded: all the muscles which go from the humerus to the fore-arm, by strengthening the articulation of these bones, make it answer as a continued lever, along which the force is communicated without any loss.

Force applied by the hands of intelligent and strong assistants, is preferable to any mechanical means in the reduction of luxations: the number of assistants may be increased at will, and the force proportioned to the resistance that is experienced: should there not be room for a sufficient number to grasp the limb, they may pull by a napkin folded longitudinally, and tied on the limb. The quantity of force employed, though it is impossible to ascertain it exactly, is better known when we make use of a certain number of assistants, than when we use a pulley, which may act with such force without our perceiving it, as to lacerate the muscles, ligaments, and even the skin which covers the articulation, and thus occasion the most direful sufferings.

It is impossible to assign the precise degree of force to be employed: it is to be varied and proportioned according to the strength of the patient and the number and force of the muscles surrounding the articulation. It has been said, that in reducing a luxation there is occasion for more address than force: it would be true to say, that the union of both is necessary. Often, six assistants accomplish that which three cannot do, and nine or ten perform that which cannot be done by six. But when the reduction cannot be effected by the number of assistants which we in reason suppose capable of overcoming the resistance, all further attempts must be suspended. The action of pullies, or any other machine analogous

logous to them, would sooner tear the integuments than produce an elongation of the muscles.

As to the direction in which the extending force is to be applied: at first it should be the same as that which the dislocation has given to the luxated bone. In order to prove how indispensably necessary this rule is, let us suppose that the head of the humerus, luxated inwards, is forced into the fossa subscapularis, between the subscapularis muscle and the scapula: in this case, the elbow is not only moved out from the trunk, but even carried backwards. Now, should we commence the reduction by pulling in the natural direction of the humerus, that is, directly outwards, the head of the bone would be pressed against the fossa subscapularis, it would not slide along easily, the force would be spent in pushing the scapula backwards, and the irritation would excite the contraction of the muscles in the part where the head of the bone has been carried.

Extension is then to be made at first in the direction which the luxated bone has taken; but in proportion as the muscles elongate and yield to the force acting on them, the bone is to be gradually brought back to its natural position; in this way the head of the bone is disengaged from the parts in which it has been placed, and is brought back to the cavity it has left, by making it describe the same course it took in escaping from it.

The best-directed extension will be useless, if the bone with which the luxated one has been articulated is not kept motionless by counter-extension, a force equal to the other, but made in a contrary direction. The counter-extending power applied to the luxated bone itself, would be attended, in almost every case, with the double inconvenience of producing a spasmodic contraction of the muscles, and preventing the elongation of them necessary for the reduction. Let us suppose that in a luxation of the thigh, the counter-extending fillet be applied in the fold of the groin of the diseased side, the consequence will be, that the rectus internus and adductores muscles, in a state of tension between the pelvis and thigh, will be curved inwards, and consequently shortened when their elongation is absolutely necessary; besides, the compression they experience will also increase their contraction. It must be, then, as in cases of fracture, on the part placed immediately above the luxated bone that we are to apply the counter-extending force: it is made by means of fillets, pulled by a number of assistants, equal to that of those who make the extension. As to the direction in which this force is to be made, it should be always perpendicular to the surface of the luxated joint. In a luxation of the elbow, for instance, the counter-extension should be made in a line parallel to the os humeri; and in a similar affection of the femur, this force applied to the pelvis should be made perpendicularly to the surface of the acetabulum. The same rule is to be observed with respect to the shoulder in luxations of the humerus, as will be mentioned in treating of particular luxations. Counter-extension is in some sort a vis inertiæ; for this reason the most intelligent assistants should be placed to make extension, the degree of which should be directed by the surgeon. Coaptation is easily performed, when the extension is sufficient: in a luxation of the humerus, when the head of the bone is disengaged, and the assistants bring it hastily to its natural direction, the surgeon seizes the moment, and with one hand presses on the superior and internal part of the arm, whilst, at the same time, with the other he supports the elbow, and thus conducts the head of the bone into the glenoid cavity. If a luxation take place in a ginglymoidal articulation, as it is rarely complete, in such cases we use extension and counter-extension only with the view of diminishing the friction of the surfaces of the joint, necessarily occasioned by the opposite motions given them in order to place them in their natural situation.

By an exact observance of the general rules just laid down, we shall be able, in almost all cases, to reduce luxations. However, when the operation fails, notwithstanding the most judicious attempts to accomplish it, the cause of failure must be looked for. Sometimes it is owing to the insufficiency of the means employed; then we succeed by increasing the number of assistants, or by diminishing the muscular force of the patient, which is done in various ways.

Change of posture often produces this effect; we have seen patients, who, while seated on a chair, and supporting themselves with the feet against the ground, could not have had their luxations reduced by the greatest efforts. By extending them on a long and settled table, their muscles, deprived of a centre of motion, yielded with an unexpected facility.

If this means proves insufficient, the patient is to be repeatedly bled, after short intervals; he is to use the warm bath, and be confined to a very low diet. At the end of twenty-four hours, when he is brought down by this treatment, the luxation, before irreducible in appearance, may now be reduced with facility. The state of intoxication, induced by spirituous liquors or opium, is favourable: the muscles attached to the luxated bone participate in the general debility, and elongate by the slightest effort. It is thus that Citizen Boyer alone, and at the first attempt, while the assistants were preparing the apparatus, reduced a luxation of the arm of an intoxicated postillion. Some authors have even advised to intoxicate the patients, when the luxations could not be reduced by the ordinary means; and cases have been met with, in which even this practice has failed.

Lastly, one more resource remains, which has sometimes succeeded; it was first employed by Lecat, in a luxation of the jaw, and consists in fatiguing, by continual action, the muscles which surround the luxated bone. It is well known that the contractile faculty of our organs is exhausted by exercising them too long, and that the frequent repetition of their contractions necessarily brings about a collapse: the surgeon just cited, availed himself of this fact. The levatores muscles of the lower jaw were spasmodically contracted, in a case of luxation of that bone, and would not admit of having it brought down: Lecat introduced a small stick between the teeth, and making use of it as a lever, combated the action of the muscles, until they fell into a state of atony, and allowed him to accomplish the reduction. David has derived similar advantages from the same practice, in luxations of the thigh and arm. This circumstance enables us to explain why a luxation that has resisted the fruitless efforts of an intelligent surgeon, aided by a sufficient number of assistants, afterwards yields to a much less considerable force, used by a less dextrous practitioner.

With respect to luxations that have been mistaken, and not reduced for several days after the accident; the swelling of the ligaments, and other soft parts, the contraction of the hole in the capsule, through which the head of the bone passed, render the reduction of them difficult, if not altogether impossible. The use of warm baths and pumping is then recommended, with a view of emptying, as it were, and rendering pliable, the parts about the joint; exercise should be combined with these, and the luxated bone should be kept in motion for some time every day, in order to disengage its head, relax the soft parts, and enlarge the opening by which it is to pass.

All these endeavours are very often fruitless, in cases where more than a month has elapsed since the luxation. The term beyond which we cannot hope to reduce luxations of the ginglymoidal articulations, is much shorter; after twenty or twenty-four days, they are in general irreducible, from an anchylosis having taken place.

We know that a luxation is reduced from the limb having recovered its natural length, shape, and direction, and from the capability of performing certain motions impossible in luxations. The limb should not be moved but with the greatest caution: a relapse of a luxation of the humerus has taken place, and a second operation has been rendered necessary, by incautiously carrying the hand to the forehead by a semicircular motion.

The cessation of pain has been considered a sign of the bone having entered its natural situation: by cessation, we are to understand a remarkable diminution, rather than a total disappearance of pain. Lastly, the noise made by the head of the bone on entering its cavity, is an unequivocal sign of the luxation being reduced. It is necessary to observe all these symptoms, in order to be convinced that the reduction has taken place; by doing so we shall be seldom mistaken, though instances to the contrary have been sometimes met with.

We very rarely fail to reduce a recent luxation, and perhaps there are none absolutely irreducible: thus we ought not to be discouraged, and desist, when we cannot easily obtain the reduction, but multiply our means, and endeavour to surmount the obstacles.

To preserve the luxated bone in its place, we have only to keep the limb without motion. Thus, as the humerus cannot be luxated but when it is at some distance from the body, a return of its dislocation will be prevented by tying the elbow to the lateral parts of the trunk. The bandage employed for keeping the limb motionless, should be applied on the opposite extremity of the bone. Thus, after a luxation of the arm, when we apply on the elbow the means for keeping the bone in its place, we act on that point of the humerus the most distant from its articulation with the scapula, and the force thus applied to the extremity of the lever is much increased.

creased. The same rule should be observed in the application of a bandage to the chin, after a luxation of the jaw. This practice is preferable to the use of the *chevestre*; consequently all authors recommend it in this particular case; but they have overlooked, in other cases, the principle established above, and from which they derived such happy effects in the treatment of luxations of the jaw. Thus, the spica bandage for the scapula, and that for the groin, are very defective in cases of luxation of the arm and thigh; for, by acting on the centre of motion of these bones, they are incapable of keeping them fixed.

When the luxation arises from any internal cause, such as paralysis of the muscles, relaxation of the ligaments, or general debility, we endeavour to remove the cause by appropriate remedies, and, at the same time, restore the luxated bone to its proper place, and keep it fixed.

Amongst the accidents with which luxations are complicated, contusion is certainly the most frequent. They may also be accompanied with inflammation, wounds, rupture of vessels, contusion of nerves, and even fracture. In treating in general of the latter, we have said, that in such case luxation always preceded the fracture; and that it was impossible to conceive, that a bone, in which a solution of continuity took place, could be luxated. The treatment to be adopted in this troublesome complication has been also pointed out. The other symptoms supervening to luxations, are treated as if they were complicated with fractures; we have nothing then to add to what has been said on that subject. It is proper, however, to observe, that paralysis, arising from a contusion of the nerves, is a frequent consequence of luxations of the arm; and when we consider the relation between the head of the humerus, and the brachial plexus, we are astonished that it does not happen oftener than it really does.

When a luxated bone is not reduced, sometimes it remains in the place into which it has been forced; but much oftener it changes its situation: it is carried along by the action of the muscles, and is removed farther and farther from the cavity of the joint. It is in this way that in luxations of the thigh upwards and outwards, the glutei muscles, by making the convex surface of the head of the femur slide along the external depression of the ilium, which it touches only by a small point, force up the bone, until the shortening of the limb is as considerable as the natural extensibility of the parts will admit.

But, whether the head of the luxated bone preserve its first position, or take another, the pressure it makes on the bone on which it rests produces two effects: the head of the one is flattened, while a depression is made in the other. The cavity of the joint sometimes preserves its natural state, and sometimes its depth diminishes; the latter takes place when the head of the bone remains near its cavity, and compresses the circumference of it. The ligaments grow thick, their lacerations consolidate, and they acquire a greater consistence than natural. The muscles, impeded in their action, lose their consistence, become of the nature of ligaments, and sometimes even are attached to the ligaments by a deposition of osseous matter, and thus form a kind of bony case, which constitutes with the displaced bone a new articulation.

If the bone is not reduced, the limb remains deformed, and scarcely any use can be made of it for some months; but in time it gradually comes to its natural direction; and when the head of the bone has acquired a certain mobility in its new articulation, it is capable of considerable

able latitude of motion. Nevertheless, the muscles, from being compressed and obstructed in their action, decay, and the size of the limb diminishes: this diminution is much more remarkable in children than in adults. This difference is so great, that it may be distinguished at first sight whether the accident happened during infancy or maturity.

CHAPTER V.

OF LUXATIONS OF THE LOWER JAW.

THIS bone can only be luxated anteriorly, whether one or both condyles escape from the glenoid cavities of the ossa temporum, with which it is articulated. Luxations of it are denominated complete or incomplete; but these denominations are erroneous, as they would lead us to believe, that the bone may be luxated without its condyles being removed entirely from the glenoid cavities of the temporal bones. Every luxation, but that anteriorly, is rendered impossible by the natural conformation of the parts. In reality, before a luxation backwards could take place, the maxilla inferior must be elevated above the point of contact of the arch formed by the teeth, and meet no opposition to its dislocation in this direction from the osseous portion of the auditory canal; and further, it must be effected without the aid of any muscle. Luxations laterally, to the right or left, are equally impossible, on account of the resistance made by the spinous processes of the sphenoid bone, and the internal ligaments of the articulation.

These ligaments, like all the others of the same part, would in truth afford a feeble resistance; for the muscles are here very evidently the principal means of strengthening the articulation: but, independently of these considerations, it is evident, from the form of the bone, that a blow given to it on its sides, tends rather, by increasing its curvature, to fracture it, than to luxate it.

In very young infants, any luxation of the jaw is impossible: in them the body and branches of the bone meet at an obtuse angle. Now, from this conformation, it follows, that the condyles, the necks of which have nearly the same direction as the body of the bone, cannot, by any motion of the jaw, be moved out of their cavities; and, in order to produce a luxation, the jaw should be pulled down, and the mouth opened to a degree which it could not admit of. Were it not for this truly admirable disposition, how frequent would not luxations be at this period of life, either from the cries of the child, or from attempts to put too large bodies into its mouth!

The causes of luxations of the lower jaw are very often internal: rarely has it been seen, that a blow a blow given from above downwards, or from before backwards, or a fall on the chin, has produced luxation of it; it almost always arises from excessive yawning. In every great depression of the jaw, the condyles slide from behind forwards, under the transverse root of the zygomatic processes. The cartilaginous cap which envelops the condyles, and follows them in all their motions, furnishes to them still an articular cavity: but the depression of the bone continuing, the ligaments give way, the condyles pass before the transverse apophyses, and thus fall into the zygomatic depressions. In this motion, the angles of the jaw are raised and carried backwards, whilst the condyles are depressed and carried forwards; and the bone, as is well known, by turning on an axis which may be supposed to pass through its branches nearly about the middle of their height, performs an imperfect revolution.

The mode in which luxations of the jaw take place has been differently explained. Some have imagined, that the bone being forcibly carried down by the submaxillary muscles, and carried forwards by the pterygoidei externi, its coronoid apophyses perched on the eminences of the cheek-bone, and became a fixed point for the action of the levatores muscles, which dragged the condyles into the zygomatic depressions. But to prove how ill-founded this theory is, it is sufficient to observe, that in no case is the coronoid apophysis carried on the eminence of the cheek-bone, and that even when the luxation has taken place, an interval can be still felt between these two bony parts.

When the mouth is shut, the axis of the maxilla inferior forms with a line drawn in the direction of the middle of the masseter muscle, an obtuse angle anteriorly, and a salient angle posteriorly; consequently when this muscle contracts, in order to move the lower jaw, its action is decomposed, one part tends to elevate it perpendicularly, and the other to carry it forwards. In proportion as the jaw is depressed, and its angles, to the external sides of which the masseters are attached, are carried upwards and backwards, the medium li[illegible] of the direction of the bone tends to become parallel with that of the masseters; and if these muscles contract when the bone is in this position, the greater part of their force is employed to bring the condyles into the zygomatic depressions.

This explanation, very little different from that given by Citizen Pinel *, in a Memoir in which he applies geometry to explain the theory of luxations, appears to us much better than the preceding, which is found in a Treatise on Diseases of the Bones, and Surgical Operations, by Chopart and Desault. But, whatever may be the manner in which the levatores of the jaw produce a luxation of this bone in its depressed state, the parts which surround the articulation are affected in the following manner: The condyles carried before the transverse root of the zygomatic processes into the zygomatic depressions, compress in a greater or less degree the deep-seated temporal nerves and those going to the masseters, which nerves, in their way to their destination, pass before the neck of these processes. This compression of the nerves by the condyles, explains the pain accompanying luxation of the jaw much more satisfactorily than does the elongation of the masseters and other

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* The Physical Journal of the Abbé Rozier contains many memoirs of Citizen Pinel's on the same subject; we should have most willingly transferred the results of them to this work, did it not require a greater share of the knowledge of geometry to understand them, than is possessed by the generality of readers.

muscles, to which they have been attributed. The tension of the masseter, temporal and internal pterygoid muscles, is not so considerable as to produce them. The pterygoideus externus is relaxed; the feeble ligaments which surround the articulation are in a state of tension, the interarticular cartilages accompany the condyles, and furnish them, even in the zygomatic depressions, with a kind of cavity. The mouth is more or less open. It is more so in recent luxations, than in those that have continued for some time. An empty space is felt before the ear, where the condyles were placed. The coronoid process forms under the cheek-bone an eminence which is felt through the cheek, or by introducing the finger into the mouth. The cheeks and temples are flattened by the lengthening of the temporal, masseter, and buccinator muscles; the saliva flows in large quantities from the mouth, irritated by constant exposure to the air, which increases its secretions. The compression made on the salivary glands, and the irritation and friction they experience, contribute to render the secretion of the saliva still more abundant. The arch formed by the teeth of the lower jaw is placed anterior to that formed by those of the upper, and the direction of their edges shews that this disposition is unnatural. Lastly, the patient can neither speak nor swallow during the first days of the luxation.

The symptoms just pointed out, and which are sufficient to enable us to establish a clear diagnosis when the luxation is recent, are far from being so well marked when the disease has continued several days or weeks. In these cases the jaw is elevated insensibly, and approaches the maxilla superior; the patient recovers by degrees the faculty of speech and deglutition, but he still stammers, and the saliva drivels from his mouth. A luxation of the jaw is far then from presenting circumstances from which we are to form so unfavourable a prognosis as that made by Hippocrates, who says that it is fatal, unless reduced before the tenth day. Perhaps trismus, or lock-jaw, which is much more dangerous than luxation, has been confounded with it. The extreme facility with which these luxations take place in some persons, does not render the prognosis more unfavourable; in such the reduction is easily effected, and often there is no necessity for having recourse to professional men to accomplish it. Lastly, the operation of reduction is in all cases simple, and certainly successful when it is done after the following manner:

The patient is to be seated on a low stool, with his head supported against the breast of an assistant, who, by placing his hands across the forehead, is to fix the head. In this position of the patient, the surgeon's hands are on a level with the mouth; which is advantageous, because he is not obliged to elevate them, and consequently can act with greater force on the jaw. The surgeon, after securing his thumbs with linen, to prevent being pained by the compression he makes on the teeth, introduces them into the mouth, and places them as far back as possible on the great molares, at the same time bending under the chin the four fingers of each hand. If there is not room for all the fingers, he uses, at least, the index and middle finger. Having thus seized the jaw, he presses with his thumbs on the great molares, brings the jaw downwards and backwards, and disengages the condyles from the zygomatic fossæ into which they were carried. When the muscles obey this effort, and it is found that the condyles yield to it and descend, the chin is to be elevated by the fingers; thus converting the bone into a lever of the first kind. In elevating the jaw, it is to be pushed backwards.

When the extension has been effectual, that is to say, when the muscles are elongated by the effort to depress the bone, they contract spasmodically the moment that the condyles are disengaged from the zygomatic fossæ, and bring these processes into the glenoid cavities so rapidly and forcibly, that there would be danger of having the thumbs much bruised by the sudden approximation of the teeth, if the precaution were not used of quickly directing them outwards, and placing them between the cheek and the jaws.

When the luxation is reduced, which is known by its characteristic symptoms disappearing, and especially by the jaws coming together in their natural manner, a relapse is prevented in this way: the chin-bandage is to be applied, to prevent the motion of the bone, which it does in a most effectual manner, as it resists the muscular action that tends to produce it at the point the farthest removed from the centre of motion. This bandage is not to be removed but when the patient takes food. During the first days, the aliments should be liquid, or such as require no mastication. When solid food can be used, the patient should be careful to support the chin with his hand each time that he wishes to depress it.

We have mentioned in the preceding chapter the manner in which Lecat succeeded in reducing a luxation of the jaw, viz. by fatiguing the muscles. This means would be proper in a similar case, and should be had recourse to.

Let us mention here, in order to censure it, the practice of reducing luxations of the jaw, by giving a blow of the fist to the under part of the chin. Some, however, say, that this defective mode has sometimes succeeded; but it is easily perceived that the blow given from below upwards, tends to force the condyles deeper and deeper into the zygomatic fossæ, and that, given from before backwards, it may fracture these processes.

The ancients placed two pieces of stick between the great molares, and, acting with them as levers to depress the lower jaw, they elevated the chin by means of a bandage, the ends of which met on the top of the head. This process, described with much perspicuity by Devigo, is extremely methodical; it is not, however, preferable to that of the moderns, which, more simple than it, has still the advantage of not exposing the teeth to be broken by the sticks, at the moment when the condyles re-enter their cavities.

In luxations which have been called incomplete, that is to say, when only one condyle has escaped from its cavity, the treatment requires so little modification, that I do not think it necessary to enter into further details on this subject.

CHAPTER VI.

OF LUXATIONS OF THE VERTEBRÆ.

THE large surfaces by which these bones correspond, the number and thickness of their ligaments, the strength of the muscles lying on the column formed by them, the small motion of which each vertebra is capable, and lastly, the vertical direction of their articulating apophyses, render a luxation of them in the dorsal and lumbar part of the column, entirely impossible. A violence, though ever so considerable, cannot displace them without first fracturing them. The same is not the case with the cervical vertebræ; the extent of their articulating surfaces is less, the ligamento-cartilaginous substance which unites their bodies has more pliability, the motion of their articulations is greater, and their articulating surfaces have an oblique direction, which allows them to have an obscure rotatory motion; consequently luxations of them are sometimes met with. I have seen a case in which the neck was luxated by a violent rotatory motion of the cervical vertebræ, and the luxation resisted all means that were employed to reduce it. The cause of impediment was felt towards the middle of the column formed by the cervical vertebræ; from which circumstance we may conclude that the dislocation did not consist of a separation of the first vertebræ from the second, which is admitted to be possible by all authors, but that it took place lower down in the cervical part of the column.

It appears from well-attested facts, that luxations may take place in the vertebral column; such as those of the head from the first vertebra, and of the first vertebra from the second. These, and especially the latter, are the most frequent; but others, though much rarer and more difficult, may however take place.

SECTION I.

Of Luxations of the Head from the first Vertebra.

THE articulation of the occipital bone with the first vertebra of the neck is strengthened by means of many ligaments, and admits of only very limited motions. It is well known, that the motions of inclination of the head to the right and left, and of flexion and extension, take place along the whole length of the cervical vertebræ. We have no instance of luxation of the head from the first vertebra by an external cause: such a dislocation, if possible, would instantly destroy the individual to whom it happened, by the compression and disorganization of the spinal marrow. But nature, which cannot bear so sudden a change, is habituated to it when it takes place gradually and insensibly; and the spinal marrow, which a sudden though inconsiderable derangement of the spine would totally disorganise, is not sensibly injured when it takes place by degrees; cases of rachitis furnish us many proofs of this. It is only in this way that we can explain how the individual from whom the preparation in the Museum of Natural History was taken, could exist until such very great deformity took place in his spine.

SECTION II.

Of Luxations of the first cervical Vertebra from the second.

It is principally in the triple articulation of these two vertebræ, that the motion of rotation of the head to the right or left takes place; for the union of the first vertebra to the occipital bone is so close, that the motion of both is the same. This rotation of the first vertebra on the second, which the laxity and weakness of the ligaments that go from one to the other, and the direction of their articulating apophyses, render easy, would be frequently carried beyond its natural bounds; and luxation would take place every time we turn our head with force, if the motion were not confined by two very thick ligaments, which go from the sides and summit of the toothlike process of the second vertebra to the edges of the great occipital hole. When this motion is forced beyond its proper limits, the ligaments are torn, and the lateral parts of the body of the first vertebra glide along on the articulating horizontal processes of the second. If the head is turned from the left to the right, the left side of the body of the vertebra is carried before its corresponding articulating surface, whilst the right side falls behind its corresponding surface. In this luxation, sometimes the tooth-like process, the ligaments of which are broken, leaves the ring formed for it by the transverse ligament and the anterior arch of the first vertebra, and presses on the spinal marrow, the substance of which it destroys; at other times it remains on its ring, but the diameter of the vertebral canal is always diminished at this place, and the spinal marrow experiences a compression, and at the same time a contortion, by which it is lacerated. It is easily conceived that the patient cannot survive a derangement of this nature; every lesion of the spinal marrow at this height is quickly fatal. Louis, in making researches on the manner of dying of hanged persons, found that those dispatched by the executioner of Lyons, perished by the luxation of the first vertebra from the second; whilst those hanged at Paris were suffocated by strangulation. He discovered the cause of this difference in a rotatory motion given to the body of the culprit by the executioner of Lyons, at the moment that the ladder was taken from under his feet. We ought to attend to this observation, when we examine in a judicial capacity the body of a person found hanged. We should carefully examine the second vertebra, and see if it be luxated. If so, the individual has not been guilty of suicide, for the luxation must have resulted from a violent motion communicated to the body by the assassins.

The following case given by J. L. Petit, furnishes an instance of luxation produced by the motion occasioned by the person himself; the circumstances of it are so extraordinary, that we shall relate them at full length.

" The only son of a tradesman, aged between " six and seven years, went into a neighbouring " shop, the proprietor of which was a friend of " his father's. This person playing with the " child, put one hand under his chin and the " other on the back of his head, and then raised " him up in the air, telling him that he was " going to shew him his grandfather, a common " expression among the vulgar. Scarcely was " the child raised from the ground, when he " began to struggle, and by his efforts disloca- " ted his neck, and died on the spot. The " father, on hearing of the death of his child, " ran in a fit of passion after his neighbour, " who fled before him, but not being able to " catch him, he threw at him a sadler's hammer

" which he had in his hand, and buried the "cutting part of it in the depression of his neck. " The weapon cut all the muscles, penetrated " into the space between the first and second " cervical vertebra, divided the spinal mar- " row, and occasioned almost instantaneous " death. Thus both perished nearly in a similar " manner." J. L. Petit, who quotes no authority to support this fact, avails himself of the opportunity of censuring this dangerous sort of play, and observes with justice, that the motion which the child gave himself was the cause of his death.

The relaxation of the ligaments of the toothlike process may favour this luxation. Such probably was the case of a young man, who found a difficulty to bring his head back to its natural posture, each time that he turned it to the right or left. There are many cases of luxation of the neck, in which death does not succeed the accident; but in these, the dislocation takes place in the third, fourth, fifth, or sixth vertebræ, and only one articulating process is luxated: in these cases, the diameter of the vertebral canal is not so much diminished as to compress the spinal marrow, and destroy

life;

life; but a wry-neck remains, which becomes incurable, unless the real cause of it be found out.

A child, whilst playing on his mother's bed, suddenly felt pain in his neck, accompanied with a distortion, which he could not remove. Desault, to whom the child was brought, discovered a luxation of the vertebræ of the neck; but before trying to reduce it, he informed the mother that the child might die in the attempt. This information terrified the mother so much, that she took away her child without having any thing done to relieve it.

A lawyer writing at his desk, heard the door behind him open; he quickly turned round his head to see who was coming in, but could not bring it back again to its natural direction. Many surgeons of Paris have seen this patient: his head was turned to the right, and slightly inclined to the shoulder of the same side. This inclination was much less than it would have been in a spasmodic contraction of the sterno-cleido-mastoideus muscle.

Thus, when, in consequence of a sudden and violent effort, the head is found turned to one side, either right or left, with inability to bring it back, the ear a little inclined to one side, and the sterno-cleido-mastoideus in a state of relaxation, there can be no doubt but that a luxation of one of the cervical vertebræ has taken place.

If the luxation produce no symptom which indicates a compression of the spinal marrow, it is prudent to abstain from all attempts to reduce it. However, if the patient absolutely insist on our interfering, we are to proceed in this way: we begin by inclining the head to the side towards which it is directed, in order to disengage the articulating process of the upper vertebræ: this part of the operation is extremely dangerous, as it may kill the patient by causing a compression on the spinal marrow. When the process is disengaged, the head and neck are brought to their right direction, by making them perform a rotatory motion the contrary of that which had taken place in the luxation. A relapse is prevented by keeping the head free from motion. This is done by means of bandages, which are attached to the head and shoulders.

CHAPTER VII.

OF LUXATIONS OF THE BONES OF THE PELVIS.

None of the assemblage of bones which form the pelvis, are susceptible of a true luxation. It is impossible that the os sacrum, enclosed between the two ossa innominata, can abandon the position in which it is confined by such powerful means. The os coccygis, which has more motion, is easier fractured than luxated. Citizen Boyer has however observed a derangement of it, in a man greatly emaciated in consequence of long disease; he had considerable ulcerations in the neighbourhood of the coccyx, and the bone itself was laid bare by the separation of a large gangrenous eschar. There was an interval of nearly two inches between the summit of the sacrum and the base of the os coccygis. But in proportion as he recovered strength, the bone was drawn backwards, and was at last united to the sacrum, notwithstanding the action of the levatores ani which are attached to it. The ossa innominata are too firmly articulated with one another, and with the sacrum, to admit of luxation; however, the symphysis pubis and sacro-iliac synchondrosis, which in the natural state admit of no motion, may be so relaxed, or the ligamento-cartilaginous substance which unites them may be so far destroyed, and the bones thereby rendered so moveable, that progression, which requires the firm union of these bones, becomes difficult. Is this relaxation of the articulations, and the consequent seceding of the bones, a means employed by nature to increase the diameters of the pelvis, and facilitate parturition? Louis has shewn, in a dissertation, which is found in the first part of the fourth volume of the Memoirs of the Academy of Surgery, how many different opinions authors have on this subject. Some, in reality, suppose that the relaxation of the articulations is the natural state towards the end of pregnancy; others consider it as being always morbid. Were we permitted to give an opinion on this subject, which comes chiefly under the cognizance of accoucheurs, we would say, that the symphysis pubis and the sacro-iliac synchondrosis abound with juices, and are swelled and relaxed in a remarkable manner, in most women during pregnancy; that this relaxation seldom goes so far as to allow the bones to move and be separated; and lastly, that the motion or separation of the bones is to be considered rather as a morbid than natural state.

A lady was suddenly delivered of a child, without almost any pain; but the ovum came away entire, and with such rapidity, that the women in the chamber could scarcely reach her in time to receive it. No bad symptom supervened until the fourth day: at this time a fever appeared, and the patient died on the seventh day. Citizen Boyer, on opening the body, perceived that the ossa pubis were moveable, and remarked this circumstance to Citizen Baudelocque. Curious to discover the cause of it, they divided the symphysis pubis, and found a great vacuum in the centre of it, round which the relaxed ligamento-cartilaginous substance formed a raised margin, which was made to puff up by the approximation of the ossa pubis. In every other particular the pelvis was well formed, and the woman had had many easy deliveries.

When a woman, towards the end of pregnancy, after parturition, or during any other time, feels pain in the articulations of the pelvis, and the mobility of the bones renders progression difficult and tottering, she should be confined to her bed; the pelvis should be surrounded with bandages drawn very tight, and the region of the pubis should be covered with astringent applications; but as these latter act only on the external surface, we are to expect much less from them than from corroborants administered internally, and the use of bandages.

The treatment suited to a relaxation of the symphysis pubis is also adapted to that of the sacro-iliac synchondrosis. We do not believe that a sudden and violent separation of the thighs can produce a disjointing of the latter, though a case of this kind is given in the Anatomico-surgical Observations of Blasius. It is probable that the motion of the bones in this case took place from the laxity of the ligaments; and this seems to be proved by the history of the patient, who was a young student in law, and, as Blasius expresses it, of an effeminate constitution and a relaxed and delicate habit.

But that which a sudden and violent separation of the thighs cannot produce may be occasioned by external violence. Louis's Dissertation, cited above, is terminated by the following case:

A sack of wheat, of three hundred and fifty pounds weight, fell on the back of a labourer who was unloading a waggon. The posterior part of the pelvis, on which the weight fell, was very much shaken; however, the pain was so inconsiderable, that it was only after some days that the patient sought relief. The bad symptoms now increased rapidly, and he died on the twentieth day. On opening the body, the os ilium of the right side was found separated from the sacrum, passing nearly three inches behind it; the parts contained in the pelvis were inflamed, there was an effusion of purulent matter into the lower region of the abdomen; and the luxated bones moved freely on one another.

The possibility of a luxation of the sacro-iliac synchondrosis by external violence is then proved beyond all doubt; but it must be very rare; and in the particular case just related, nothing less than a very great weight favoured by the position of the pelvis could have caused it. An antiphlogistic treatment is particularly adapted to such cases; for the danger depends on the inflammation which must necessarily follow such considerable external violence, and which, if it extend to the organs contained in the cavity of the pelvis, may produce the worst consequences. The accession of inflammation should, if possible, be prevented; if not, it becomes quickly fatal, unless it is arrested in its progress by copious and repeated bleedings, the use of warm baths, emollient fomentations, and the most rigid abstinence.

As to the supposed luxations of the ribs admitted by some authors, we should have observed, respecting them, the same silence as J. L. Petit, did not a case inserted in the Memoirs of the Academy of Surgery, after the death of that celebrated practitioner, seem to establish the possibility of their taking place. It is not, however, difficult to perceive, in reading this case, that the surgeon who has given it has committed a strange mistake, by taking a simple fracture of the posterior extremity of these bones for a luxation of them. If we attend to the number and force of the ligaments which attach the ribs to the vertebræ and sternum, and also to the manner in which the intercostal and other muscles confine them, we shall not easily conceive how external violence, whether it acts on their middle or extremities, can luxate them. They are so firmly attached to the surrounding parts, that it is very difficult to separate them from the body in the dead subject; and in preparing skeletons, we often break them if we are not careful to cut all their bonds of union before we attempt to detach them from the parts with which they are articulated. All the symptoms presented by the case of the patient of Buttet, surgeon of Etampes, indicate a fracture of the neck or posterior extremity of the rib; the pain, crepitation, and motion of the bone, are characteristic marks of it. The author proves nothing by saying, that the noise arising from the motion of the rib was very distinct, and heard by himself and his assistants, whilst that which characterizes fractures is only sensible to the hands, and that the rib could be moved in its whole length. First, it cannot be conceived how the noise which accompanies the motion of fractured bones can be sensible to the organ of touch. Next, the fracture having taken place very near the posterior extremity of the rib, rendered it impossible to draw any conclusion from its motion, as in this case it would have the appearance of moving entirely along its length; besides, it is very difficult to feel this motion through the muscles of the spine. Thus we regard luxations of the ribs as totally impossible, though Ambrose Paré, and after him Barbette, Junker, Platner, and Heister, admit them, and give different species of them.

We must not, with Lieutaud, give this name to affections in which the body of the dorsal vertebræ and the head of the rib are separated from one another by a caries of these parts.

It might happen, that by a violent and sudden contraction of the pectoralis major, the cartilage of the sixth true rib, to the whole extent of which this muscle is attached, might be separated from that of the seventh; and that the very thin capsule which keeps them together might be torn. The pain alone would point out this affection. With respect to the depression of the other cartilages, and of the appendix xyphoides, we refer to what we have said on that subject in treating of fractures of these parts.

CHAPTER VIII.

OF LUXATIONS OF THE CLAVICLE.

LUXATIONS are in general much less frequently met with than fractures. How numerous are fractures of the body and neck of the femur compared to luxations of this bone! A surgeon, who has seen hundreds of the former, generally meets in the course of a long and extensive practice only a very few cases of primary luxations of the thigh. These general considerations apply, in a certain degree, to the bone, the luxations of which form the subject of this chapter. We find, in fact, that fractures of the clavicle are much more frequent than luxations of it, and it has been supposed that they bear the proportion to one another of 6 to 1. These luxations are distinguished into that of the extremity next the sternum, and that of the extremity next the humerus.

SECTION I.

Of Luxations of the Extremity next the Sternum.

THIS extremity presents a large surface, which is articulated with another much smaller in the lateral and superior part of the sternum. This disproportion in the articulating surfaces disposes to dislocations, which are also favoured by the weakness of the ligaments, and the motions and functions of the joint. It is, in fact, in this articulation, furnished internally with an inter-articular cartilaginous lamina, that all the efforts made by the superior extremity terminate.

The clavicle may be luxated at this extremity forwards, backwards, and upwards, but never downwards: the cartilage of the first rib borders its extremity on this side, and renders a luxation of it in this direction impossible. Of the three possible kinds of luxation, that anteriorly is the most frequent, and indeed almost the only one met with. To effect it, it is only necessary that the clavicle, naturally directed backwards, be carried still more in that direction: this motion of the shoulder backwards is the easiest and most extensive of any of which this part is capable. Accordingly, nature has diminished, as much as in her power, the tendency to dislocation which results from it, by giving great force to the anterior ligament, which is still strengthened by the portion of the sterno-cleido-mastoideus attached to the sternum. Luxations backwards and upwards are very rare: to effect the former, the shoulder must have been pushed forwards violently and to a considerable distance, and at the same time suddenly depressed by a great force: a combination of these circumstances sometimes takes place in falls. Lastly, of the two luxations upwards and backwards, the latter is that most rarely met with.

If the shoulder be pushed violently backwards, the extremity of the clavicle next the sternum is carried forwards, lacerates the capsule of the articulation, the anterior ligament, and the tendon of the sterno-cleido-mastoideus muscle, abandons the surface it was articulated with, and passes before the superior part of the sternum; forming under the skin, the only covering at this place, a hard, projecting, circumscribed tumour, which follows the motions of the shoulder. The force which causes the luxation will act with the greatest advantage, if applied to the point of the shoulder, which is the part the most distant from the articulation in which the dislocation takes place. A baker's boy, in order to repose himself, rested his basket full of bread on the parapet of a bridge: the basket lost its equilibrium, and was falling backwards; the boy endeavoured to oppose it, and in the effort, the straps which passed under each arm-pit acted so powerfully on the point of his shoulders, that one of his clavicles was luxated forwards.

When the shoulder is suddenly depressed, the extremity of the clavicle next the sternum is luxated easily upwards, as there is nothing to limit its motion in this direction, except the interclavicular ligament; which, however, being relaxed by the greater contiguity of the two bones, makes only a very feeble resistance.

In the luxation backwards, the extremity of the clavicle is carried behind the superior part of the sternum; but in this, as in the two preceding, all the ligaments that surround the articulation are torn: this is the case even with the costo-clavicular ligament, which does not immediately belong to it. This laceration, with the peculiarity of structure, renders the treatment of this luxation difficult.

The superficial situation of the clavicle renders a diagnosis very easy. If the luxation be forwards, a hard circumscribed tumour is felt, or even seen, on the anterior and superior part of the sternum, which is made to disappear by carrying the shoulder forwards and outwards; and an empty space is found where the head of the clavicle should be placed, &c. &c. In luxation upwards, the space between the sternal ends of the clavicles is diminished. If the luxation be backwards, there is a depression at the place where the extremity of the clavicle should be placed, and a tumour is formed by it at the anterior and inferior part of the neck, which, as J. L. Petit observes, may compress the trachea arteria, œsophagus, jugular vein, carotid artery, and nerves; lastly, the head is inclined towards the affected side. By attending to these appearances, and to the history of the circumstances, we shall be able to ascertain the existence of the dislocation, and find out in what direction it has taken place.

A luxation of this extremity of the clavicle is reduced in the same way as a fracture of this bone; that is, by making a lever of the arm, by means of which the shoulder is brought outwards; and when the shoulder is brought outwards in this manner it is pushed forwards, if the luxation has taken place in that direction; backwards, if it be posteriorly; and we elevate it if the bone is dislocated upwards. By these means we make extension, disengage the extremity of the bone, and bring it towards its corresponding articulating surface: when in this state, by pressing on it with the thumb, it is restored to its natural situation; but it is as difficult to keep it in its place, as it is easy to reduce it. All the ligaments being more or less lacerated, the articulating surfaces, which are smooth and disposed obliquely, slide easily on one another from the least motion of the shoulder.

The apparatus used in fractures of the clavicle is to be applied in cases of luxations of the extremity next the sternum. But it must be observed, that this apparatus, which makes a continued extension by means of the cushion placed in the axilla, though ever so well applied, will not keep the clavicle exactly in its place; and notwithstanding the greatest assiduity of the surgeon, the luxated extremity will remain more prominent than that of the opposite side. This slight and inevitable deformity would not be prevented, even though the tourniquet proposed by Brasdor to make pressure on the extremity, and thus keep it reduced, were used. It will be necessary to continue the use of the bandage for a considerable time, in order to favour the union of the lacerated ligaments.

SECTION II.

Of Luxations of the Extremity next the Humerus.

THESE luxations, less frequent than the former, take place by a mutual sliding of two oblique and small surfaces on one another, which form the articulation of the humeral extremity of the clavicle with the acromion of the scapula. As these articulating surfaces are turned upwards, luxation seldom takes place but in this direction; it is proved, however, that it may take place downwards, and that the extremity of the clavicle may slide and pass under the acromion. The very great force of the conoid and trapezoid ligaments which unite the clavicle to the scapula, renders luxations of the humeral extremity very rare. The dislocation upwards, the only one that merits particular consideration, may be occasioned by a fall on the summit of the shoulder; in which case, the humeral extremity of the clavicle slides upwards on the facet of the acromion, and mounts on this process, which is itself carried a little under the displaced bone, when the shoulder is drawn inwards by the action of the muscles which bring the arm near the body. In this luxation, the capsule, the superior ligament of the articulation, as also the aponeurotic expansion of the trapezius and deltoid muscles, and the conoid and trapezoid ligaments, are ruptured.

This luxation, which is always occasioned by falling on the shoulder, may be said to be produced by the violence of the fall and the action of the trapezius muscle. This muscle, the fibres of which are attached to the external half of the clavicle, contracts, and tends to elevate the shoulder, and bring it backwards; but as the shoulder is forced against the ground, and cannot obey this action, the conoid and trapezoid ligaments are torn, and the humeral extremity of the clavicle displaced. This explanation will not appear improbable to those who know what prodigious force muscles, in appearance the weakest, exert, and what enormous resistance they sometimes surmount.

The existence of this luxation is easily ascertained. If there be pain in the top of the shoulder succeeding to a fall on that part; and if, on examination, the extremity of the clavicle be found projecting under the skin covering the acromion, we may be sure it has taken place. Besides, the patient inclines his head to the affected side, and moves as little as possible either the arm or shoulder, because he cannot move these parts without calling into action the deltoid or some other muscle, which would consequently extend the motion to the diseased part, and cause pain. This luxation is not attended with such dangerous consequences as those related by Ambrose Paré. He says *, the bone cannot be reduced, the patient will remain disabled, and will never be able to carry his hand to his mouth or head. In fact, the clavicle has been often but imperfectly reduced, and the patients were not disabled; and this is what is observed even in the greater number of cases: the ligaments heal without uniting, and the luxation relapses as soon as the bandage is removed. I have seen a person who had a luxation of this kind, and who, after five months regular treatment, could not move his arm without dislocating the clavicle;

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* Works of Ambrose Paré, chap. ii. of Luxations of the Clavicle.

vicle; whenever he used his arm, the scapula was carried backwards, and its base raised up the skin.

We reduce this luxation by carrying the arm outwards, by putting a cushion in the axilla, and applying Desault's bandage for fractures of the clavicle, in such a manner as that all the turns of it which ascend from the elbow to the shoulder may bear on the luxated extremity, compress it, and keep it in its place.

CHAPTER IX.

OF LUXATIONS OF THE OS HUMERI.

THERE is no articulation which admits of such extensive motion, as that of the humerus with the scapula; consequently, luxations of the former are extremely frequent: their number equals, if not exceeds, that of the luxations of all the other bones. The head of the humerus, a large hemispherical body, is not, properly speaking, entirely received in the glenoid cavity of the scapula, which, notwithstanding the fibrous margin with which it is surrounded, is not deep enough for this purpose. It touches this cavity by only a very few points; the greater part of its surface is in contact with the orbicular ligament. The articulation itself, though admitting of great latitude of motion, is by no means provided with very strong ligaments; it derives its principal strength from the orbicular ligament, and an accessory one which comes from the coronoid process of the scapula. These circumstances render dislocations of the arm so easy, that, were it not for the great mobility of the scapula, which follows the humerus in all its motions, the latter would be dislocated by every trifling effort. The mobility, then, of the articulating surfaces diminishes the frequency of luxations, which are favoured by so many circumstances.

The humerus can be luxated only in three directions, downwards, inwards or forwards, and outwards or backwards. Luxation upwards, admitted by some authors, is rendered impossible by many causes: first, the acromion and coracoid process form, with the triangular ligament which goes from the one to the other, a kind of vault over the articulation; therefore, the first effect of every effort to push the humerus upwards, would tend to fracture these two processes, and tear their ligament; and as the head of the humerus should be carried at once upwards and outwards, before it could be luxated in this direction, the trunk prevents this disposition of the parts by not allowing the elbow to be brought sufficiently inwards. Lastly, the tendons of the biceps and supraspinatus, and the fleshy mass of the deltoid muscle, efficaciously prevent this luxation. There is even one of the three species of luxation of the humerus, of which, though it has been described, and the possibility made evident, we are not acquainted with a single instance: it is the luxation outwards or backwards. The other two then are those that merit the attention of practitioners: the first is oftener met with than the second; it is even so frequent, that many authors, conformably to the opinion of Hippocrates, think that every primary luxation of the humerus takes place downwards: we say primary luxation; for the possibility of a subsequent change of place, by which the head of the luxated humerus is carried forwards, is generally admitted. In order to explain this subsequent change of place, let us suppose the head of the humerus, in a luxation downwards, to be placed between the tendon of the long portion of the triceps, and that of the subscapularis; but by a fall or muscular action, to be pushed forwards and inwards, and obliged to lodge between the fossa subscapularis and the muscle of that name. Luxation downwards can never be converted into that backwards; though the contrary opinion is supported by J. L. Petit; but, respectable as his authority may be, we easily conceive that the resistance made by the tendon of the long portion of the triceps must prevent it.

Luxation of the humerus downwards is the most frequent, not only on account of the great extent of motion of the bone necessary to produce it, but also because the lower part of the orbicular ligament is the thinnest and weakest, and the least supported. The tendons of the supraspinatus, teres minor, and subscapularis, are in some sort confounded with the orbicular ligament before they are inserted into the tuberosities of the humerus, and thus increase, in a remarkable manner, its strength and thickness on the superior side; the tendons of the teres minor and infraspinatus support the head of the bone on the outside; above, the same purpose is answered by the tendon of the supraspinatus, and that of the long portion of the biceps; and anteriorly and interiorly it is protected by the tendon of the subscapularis. The inferior part of the articulation is deprived of a similar support, and corresponds to the cellular substance, the glands, nerves, and blood-vessels that fill the axilla. Now, when the elbow is carried upwards and outwards, the head of the humerus, by pressing on the inferior side of the orbicular ligament, may easily lacerate it; but in the mean time, the tendon of the long portion of the triceps opposes its escape precisely at the inferior part of the cavity, and forces it to pass out at its inferior and internal part. In this luxation the head of the humerus is found placed on the superior and internal part of the external costa of the scapula, having before it the anterior edge of the subscapularis, and the tendon of the long portion of the triceps behind it. The laceration of the capsular ligament is inseparable from this luxation; it could not take place without this happening.

In order that this dislocation may take place, the elbow must be moved outwards from the body *, and even a little elevated: in this motion of the arm, the head of the humerus slides from above downwards, and presses on the internal and inferior part of the orbicular ligament. The difficulty we experience in luxating the arm downwards in the dead body, is so great, that we may conclude that the weight of the body alone would seldom luxate it in falls on the elbow, were it not for the co-operation of muscular action. In order to elucidate the manner in which

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* I have given in the Journal de Médecine, the history of a luxation produced by a fall on the top of the shoulder; but we may easily conceive that such cases must be extremely rare, and that fracture of the neck of the humerus is to be expected from such a cause, rather than luxation.

which this luxation is effected, let us suppose a case: A person falls from a place somewhat elevated, on his elbow moved out from the body; but, on the very moment that the elbow reaches the ground, the pectoralis major, teres major, and latissimus dorsi, contract, and draw the arm near the body: now, the consequence must be, as the elbow is fixed against the ground, that the muscles will bring downwards and inwards the head of the humerus. This force, co-operating with that of the fall, forces the head of the humerus through the ligament, and produces a luxation downwards. The humerus represents here, as in all its motions, a lever of the third kind; but its relations are changed, the force remaining always at the middle, the *point d'appui*, which was in the articulation of the humerus, is now transferred to the elbow.

Some authors think, that when the arm is moved out from the body, the action of the deltoid muscle alone can produce a dislocation of it; and in support of this opinion they refer to the case of a person who luxated his arm in attempting to raise a registry-book.

When the luxation has taken place, the head of the humerus, placed, as already observed, between the subscapularis muscle and the tendon of the long portion of the triceps, fills the hollow of the arm-pit; the orbicular ligament, torn on its internal side, is stretched over, and covers the glenoid cavity; the deltoides and infraspinatus muscles are elongated on account of the separation of their points of insertion; the teres minor and subscapularis are neither stretched nor elongated, for if their superior fibres experience a tension, the inferior are relaxed; the coraco-brachialis, the biceps and triceps, are elongated, and the fore-arm is more or less bent; the brachial plexus and axillary vessels are not injured; the circumflex nerve, which turns under the head of the humerus in its course to the deltoid muscle, is overstretched, and the injury to which it is exposed may destroy its function: a paralysis of the deltoides results; and, consequently, an inability to elevate the arm outwards, is sometimes a consequence of an injury done to this nerve in a luxation of the humerus.

The symptoms which mark a luxation of the arm, are numerous, and easy to be distinguished. The affected arm is longer than the other: we convince ourselves of this fact, by undressing the patient, and examining the height of his elbows. The arm loses its vertical position, and inclines obliquely downwards and outwards, and the elbow is very much separated from the body if the luxation be recent. When, in the healthy state, the fingers are moved along the external part of the os humeri, an equal resistance is felt along its whole length; but, in a case of luxation, it is only at the middle part that this resistance is felt; on the upper part, the integuments, no longer supported by the superior extremity of the bone, yield to the pressure of the fingers. The acromion projects; an empty space is felt under it, in which the head of the humerus should be placed; the summit of the shoulder has lost its roundness; and a hard tumour, formed by the head of the humerus, is found in the axilla. The patient cannot perform the motion of circumduction, in which the arm describes a cone, the base of which is at the ends of the fingers, and the summit at the articulation of the humerus with the scapula; neither can he bring his hand to his head by describing a semicircular line from without inwards. If we direct him to perform this motion, he bends the fore-arm, and stoops his head towards his hand. It is often unnecessary to attend to all these circumstances, as the existence of the luxation may be ascertained by a simple inspection of the arm, but especially by the change in its direction. However, we have given an ample detail of all its characteristic marks, as it is well attested that uninformed or inattentive surgeons have sometimes been mistaken in their diagnosis. We have mentioned, in treating of fractures of the humerus, the marks by which luxations of this bone downwards are distinguished from fractures of its neck.

The prognosis is uncertain; for though very often no serious symptom accompanies affections of this kind, still there may be great difficulty in reducing the bone, and a paralysis of the deltoid muscle may ensue. Professor Boyer has seen three cases of this kind.

The means proposed to effect the reduction are extremely numerous; and, defective as the greater number of them are, it may be useful to take a view of them, in order to point out what led to their disuse. The most ancient is the *ambe* of Hippocrates, a machine not used in these times, and scarcely to be met with in the richest cabinets of surgical apparatus. It is composed of a piece of wood, rising vertically from a pedestal, which is fixed; with the vertical piece is articulated, after the manner of a hinge, an horizontal piece, with a gutter formed in it, in which the luxated limb is laid, and secured with leather strings. The patient places himself on one side of the machine; his arm is extended in the gutter, and secured; the angle formed by the union of the ascending piece and the horizontal branch is lodged in his arm-pit, and then the horizontal branch is depressed. In this way extension is made, whilst the vertical part makes counter-extension, and its superior part tends to force the head of the humerus into its cavity. But there is nothing to fix the scapula, and the compression made by the superior part of the vertical portion of the machine tends to force the head of the humerus into its cavity before it is disengaged by the extension; besides, it compresses the muscles, stimulates them to contraction, and thus renders the elongation of them impossible.

The *ladder* is attended with the same inconveniencies. In this process, a ladder, six or seven feet high, is placed vertically, and fixed in this situation: the upper step is surrounded by a linen cloth; the patient is elevated by means of a stool, so as to be able to pass the diseased arm over this step; a number of assistants take hold of the arm hanging on the opposite side of the ladder, and extend it, whilst the weight of the patient, from under whom the stool has been taken, makes counter-extension, and the step tends, by pushing upwards the head of the humerus, to force it into its cavity. This process has this additional disadvantage, that the force cannot be proportioned to the resistance, since it is always in proportion to the weight of the patient. If he is very tall and corpulent, the neck of the humerus may be fractured.

The process by the *door* has the same disadvantages as the former, and differs from it only by placing the upper edge of a door, instead of the upper step of a ladder, under the axilla. The same objections may be made to the process in which two strong men, by placing a stick in the axilla, and putting the ends of it on their shoulders, raise the patient from the ground, and keep him suspended, whilst a number of assistants draw the arm downwards.

Similar defects are found in many other machines recommended for this purpose; that proposed by J. L. Petit is not exempt from them; and, notwithstanding the engraving and long description which this surgeon has given of it, it is impossible to understand its mechanism. Independently of the great pressure which it makes on the muscles, the force with which it acts is difficultly appreciated.

It has been also proposed to extend the patient on a carpet spread on the floor, while the surgeon, extended also, but with his feet towards the head of the patient, places his left heel in the axilla, and presses with it on the head of the humerus, and, at the same time, draws the arm with all his force. But the arm being parallel to the trunk, it becomes difficult to disengage the head of the humerus; the heel compresses the muscles, and there is nothing to fix the scapula.

Lastly, it has been recommended to place the patient and surgeon seated opposite one another, with the hand of the former secured between the knees of the latter; this being done, the surgeon inclines backwards, and brings with him the hand squeezed between his knees, whilst with his hands he endeavours to restore the head of the humerus. It is easily perceived that the operator can, in this situation, exert but very little force; and, if this process has succeeded in some cases, it is because the reduction was very easy, and would have been accomplished by any means, even the least rational.

The method we are now to describe is by much the least exceptionable: its effects are not contrary to any of all the rules laid down in treating of the general therapeutics of luxations.

A large piece of old linen, rolled up in a bundle, or, still better, a broad cushion of oaten chaff, folded on itself, is to be placed as high as possible in the hollow of the arm-pit; the bundle ought to be big enough to fill the entire hollow, and to reach beyond the borders of it in such a manner as to diminish the pressure made on the tendons of the pectoralis major, latissimus dorsi, and teres major, by counter-extension. A sheet or table-cloth, folded longitudinally to about four fingers breadth, is used for making counter-extension; the middle of this is applied on the cushion, and the ends of it, carried obliquely before and behind the breast to the opposite shoulder, are committed to assistants. This part of the apparatus fixes the trunk, and even the scapula, to a certain degree; but this bone, uncompressed towards the middle of its external border, would yield to the extending force, and the reduction would be impracticable, if it were not fixed in the following manner: a napkin, folded longitudinally, to about three fingers breadth, is applied across the top of the shoulder, and one or two assistants take the ends of it, which are brought horizontally before and behind the breast to the other side of the trunk; and lastly, another assistant presses the acromion from above downwards, and prevents the folded napkin from moving out of its place.

Extension is made by assistants, who pull by a napkin, folded diagonally, and tied round the wrist of the patient. Every thing being thus arranged, and the patient seated, the surgeon places himself on the external side of the arm, directs the proceedings, attends to the elongation of the muscles, and, when he sees them yield to the extending efforts, conducts the head of the bone into its cavity. The two hands placed on the internal and superior part of the arm are sufficient for this purpose; a napkin passed under the patient's arm and round the neck of the surgeon would be both embarrassing and useless. The assistants employed for making extension draw first in an oblique direction downwards and outwards; but, apprised by the surgeon, they bring the arm at the proper time in its natural direction, whilst he forces upwards and outwards the head of the humerus. That the coaptation may be made with the greatest advantage possible, the operator should convert the humerus into a lever of the third species, the inferior part of which is supported against his breast. The effort of the assistants who extend the arm is to co-operate with that of the operator, who directs all the proceedings. When the muscles are sufficiently elongated, and the head of the bone disengaged, the elbow is brought inwards and forwards, in order to give the humerus its natural direction. This is to be done without suspending the extension, the cessation of which would allow the muscles to reassume their power, and bring back the head of the humerus to the place from which it had been disengaged.

When the first attempts at reduction fail, bleedings and warm baths are to be had recourse to; and, after these have had their effect, the patient is to be placed on a strong and firmly-fixed table, and the operation is to be recommenced. By repeating the attempts, the muscles are fatigued, their force is exhausted, and the reduction is rendered more easy. If, at the end of some days, after repeated endeavours, and inducing

ducing debility by the usual means, even by the excessive use of spirits and opium, we are not successful, we advise the patient to call in other practitioners; but in no case or under no circumstances are pullies or other extending machines of this kind to be used. I have seen in a department distant from the capital, a patient absolutely tortured by the violent means that were employed to reduce a luxation of his arm, and yet the reduction was not accomplished. The patient, an adult, strong and robust, was stretched on a bench, and held down by a number of men; a band passed round the inferior part of the luxated arm, was tied to a vine-press, which was turned by twelve men; but scarcely had they put the machine in motion, when the skin of the shoulder and arm-pit cracked in many places; the laceration would have been more considerable, or indeed the arm would have been torn from the body, if the assistants who were employed to hold down the patient had remained deaf to his cries.

Citizen Boyer has seen the same consequences from similar attempts to reduce an old luxation of the humerus. The bands for making counter-extension were fixed to a post, and extension was made by a pulley. The pectoralis major, latissimus dorsi, and teres major, were not elongated in the smallest degree, and the attempt was given up, without accomplishing the reduction, though the force employed was so considerable as to lacerate the skin, and produce the most exquisite torture. It has been supposed that the narrowness of the opening through which the head of the humerus has escaped, might resist its reduction; and in cases where this obstacle is suspected, surgeons have directed to move the luxated arm in a variety of directions, in order to make the opening wider by increasing the laceration. But, independently of the difficulty of ascertaining the reality of this cause, how can the opening through which the head of the bone has escaped, be too little at the end of a few hours to readmit it? Is not the effect of this practice, in cases where this obstacle has been supposed, to be attributed to the lassitude of the muscles that it produces, rather than to an enlargement of the laceration in the orbicular ligament?

We have said, in treating of luxations in general, that at the end of a month or six weeks, reduction is, if not impossible, at least very difficult; and we have pointed out the method to be pursued when this operation is attempted in these cases.

Luxation of the humerus inwards may be primary or secondary. If a person fall from a height on his elbow placed outwards and backwards, the action of the muscles co-operates with the effects of the fall, and both force out the head of the humerus at the anterior and internal part of its cavity, and propel it into the fossa subscapularis between the scapula and subscapularis muscle. In this luxation, the external edge of the subscapularis is moved from the fossa by the head of the humerus, which lacerates even the texture of this muscle, when the violence has been great, and the luxation effected with rapidity. As to secondary luxations in this direction, they take place when the head of the humerus deserts the part of the scapula on which it was placed in a luxation downwards, and is drawn by the action of the muscles, particularly by that of the pectoralis major, along the fossa subscapularis, and under the subscapularis muscle to the inferior side of the clavicle.

Some have believed that the head of the humerus might be carried upwards towards the clavicle, and be placed between the great pectoral muscle and the subscapularis; but the relations of the latter muscle with the internal side of the articulation are such, that it should be turned under the head of the humerus before a secondary luxation could take place in this direction. The subscapularis, carried inwards, remains always at the internal side of the head of the humerus; and if this latter part ascends near to the coracoid process, it can only do so by sliding between the subscapularis muscle and the fossa of the same name: in that case, the hard and round tumour which is felt below the clavicle and before the point of the shoulder, is formed by the head of the humerus, covered not only by the pectoralis major and minor, but also by the subscapularis.

In the luxation of the humerus inwards, the arm preserves nearly its natural length, unless the head of the bone be brought secondarily towards the clavicle, in which case it is shortened. The elbow is placed outwards from the body, and carried backwards; a bony eminence is felt at the superior and external part of the breast, before the point of the shoulder, and below the clavicle; there is no tumour in the axilla; the point of the shoulder is more round, and the acromion is less prominent than in luxations downwards; lastly, the motion of circumduction is impossible.

The prognosis is more unfavourable in this luxation than in that downwards; the straining of the parts has been greater, the laceration more considerable, and the reduction is more difficult; it is particularly difficult when the luxation is of a long standing, and of the secondary kind. The head of the bone, in these circumstances, often grows to the superior part of the fossa subscapularis. The process for reducing it is the same as that used in the luxation downwards, with this slight difference: the assistants who extend the arm are to pull at first in the direction of the elbow which was carried backwards, and not bring it forwards but at the moment when the head of the bone is disengaged from the muscle and the fossa subscapularis. If the luxation be secondary, we are first to endeavour to bring the head of the humerus downwards into the hollow of the armpit, and then replace it as in cases of luxation downwards.

There is no well-attested instance of luxation of the humerus outwards or backwards, though many authors appear to have admitted the possibility of it. It cannot take place secondarily, and succeed to a luxation downwards, because the tendon of the long portion of the triceps opposes it. Should a fall on the elbow placed inwards and forwards produce it primarily, the head of the humerus would be carried into the fossa infraspinalis between the external part of this fossa and the infraspinatus and teres minor muscles. The resistance of the spine of the scapula would prevent the humerus from ascending so high as to occasion a shortness of the arm; but the elbow would be placed inwards and forwards. The acromion would project, especially anteriorly; an eminence would be felt behind the shoulder below the spine of the scapula; the motion of the humerus would be painful, and that of circumduction impossible. It is to be reduced according to the rules already laid down; but the arm is to be drawn at first inwards and forwards, in order to disengage the head of the bone before bringing it to its natural direction.

Whatever may be the kind of luxation, the reduced bone is easily kept in its place, by preventing the motion of the arm; and as luxation can take place only when the arm is at some distance from the trunk, a return of it will be certainly prevented by tying the elbow to the side. A bandage carried several times round the trunk, and including the elbow, answers this purpose. The spica bandage applied to the point of the shoulder would not answer so well the proposed end; its action, from being confined to the superior extremity of the humerus, would not prevent the motion of the elbow; consequently we find, that it is now only used to retain emollient and resolvent topical applications, which it is sometimes necessary to apply to the shoulder. *Different symptoms which may accompany or succeed luxations of the humerus, such as pain, paralysis of the deltoid muscle, or œdema of the arm, may render such topical applications necessary.

If the shoulder be much contused, and the pain considerable, emollient cataplasms are to be applied to the pained part; and if the patient be young and strong, some blood is to be taken away. When, by this treatment, the pain is diminished, the emollients are to be replaced by resolvents, with the view of discussing the ecchymosis. In the generality of cases, the pain has entirely vanished, and the patient has recovered the entire use of his arm at the end of a month.

The œdema may arise from the compression made by the head of the humerus in the axilla on the veins and lymphatic vessels, which bring back the fluids of the superior extremity. The round figure of the head of the humerus and its polished surface render it unfit for making great pressure, so that it slides easily over the soft parts, and seldom produces this symptom. Paralysis is much more frequently met with, and it would be a much more frequent consequence if the brachial plexus and axillary vessels did not easily escape from the round and slippery surface of the head of the humerus. If these nerves are slightly compressed by this bony eminence, a numbness and pain are felt in the arm, but these symptoms disappear on the reduction being accomplished. This is not the case with the paralysis produced by the contusion and disorganization of the plexus; it often resists the application of the most powerful remedies; however, the effects of blisters and frictions, with irritating substances, such as the tincture of cantharides, may be tried. I have seen much benefit arise in these cases from burning moxa behind the clavicle, and immediately above the brachial plexus.

The paralysis, as we have mentioned, is sometimes confined to the deltoid muscle. It depends then on the contusion and injury done to the circumflex nerve by the head of the humerus which bends it under it. This affection is sometimes very obstinate, resists the usual remedies, and is followed by a diminution of volume in the muscle.

Lastly, there is an accident which may arise from the efforts to reduce a luxation, with which the practitioner ought to be made acquainted, in order that he may not be alarmed at its taking place. It is generally produced by the violent efforts necessary to reduce an old luxation, and it was in a case of this kind that it presented itself to Desault. This surgeon, after reducing with great difficulty a luxation inwards, which had continued for six weeks, perceived a tumour forming rapidly under the great pectoral muscle, which soon extended to the axilla, and filled its entire cavity. Desault and his assistants thought that an aneurism was produced by the rupture of an artery: but their apprehensions were soon removed. It afterwards appeared that the tumour was formed, according to the opinion of some, by an effusion of venous blood; according to that of others, by air escaping from the lungs; but the former appears by much the most probable, as the tumour disappeared on the thirteenth day, and left a large ecchymosis, which was not discussed before the twenty-seventh day.

Anchylosis is never a consequence of luxations of the humerus, when they are reduced. The motion of the arm, first impeded by the pain, becomes daily more free, and is soon performed with as much facility as before the luxation had taken place. The recovery of the patient is accelerated by moving the arm every day as much as the state of the soft parts surrounding the articulation will admit. It is even rare to find an anchylosis in luxations of the arm which have not been reduced. The head of the humerus makes a depression in the part of the scapula with which it is in contact, and forms a new articulation, which allows more or less extensive motion; but it will be for ever impossible to carry the hand semicircularly to the head.

CHAPTER X.

OF LUXATIONS OF THE FORE-ARM.

THIS chapter will be divided into three sections: in the first we will treat of luxations of both bones of the fore-arm from the humerus; in the second we will describe luxation of the superior extremity of the radius from the ulna; and in the third we will treat of luxations of the inferior extremity of the ulna from the radius.

SECTION I.

Of Luxations of the Fore-arm from the Humerus.

NOTWITHSTANDING the extent of the surfaces of the articulation of the radius and ulna with the os humeri, the strength of the muscles and ligaments surrounding it, and the mutual reception of the eminences which makes it a perfect angular ginglymus, a dislocation of these two bones from the extremity of the humerus may take place at the same time. They are luxated for the most part backwards, sometimes laterally, but very rarely anteriorly: the latter luxation cannot take place without a fracture of the olecranon. Luxation backwards is the most frequent: it is facilitated by the small size of the coronoid process, which, when the extremity of the humerus is forcibly pushed downwards and forwards, may slide behind it, and mount up even to the cavity which receives the olecranon during the extension of the fore-arm.

Luxations laterally are much less frequent, and are always incomplete. The great extent of the articulating surfaces in their transverse direction, the reciprocal union of their inequalities, and especially the strength of the ligaments and muscles, which, arising from the internal and external condyles of the inferior extremity of the humerus, go to the fore-arm and hand, give great strength to the articulation, and render it impossible to effect by any violence a complete luxation laterally.

In the luxation backwards, the radius and ulna may ascend more or less behind the humerus; but the coronoid process of the ulna is always carried above the articular pulley, and is found lodged in the cavity destined to receive the olecranon. The head of the radius is placed behind and above the external condyle of the humerus. The annular ligament, which confines the superior extremity of the radius to the ulna, may be lacerated: in which case, even when the bones are reduced, it is difficult to keep them in their proper places, as the radius tends constantly to separate from the ulna.

This luxation always takes place from a fall on the hand; for, when we are falling, we are led by a mechanical instinct to bring our hands forwards to protect the body. If, in this case, the superior extremity, instead of resting vertically on the ground, be placed obliquely with the hand nearly in a state of supination, the repulsion which it receives from the ground will cause the two bones of the fore-arm to ascend behind the humerus, whilst the weight of the body pressing on the humerus directed obliquely downwards, forces its extremity to pass down before the coronoid process of the cubitus.

The fore-arm in this luxation is in a state of demi-flexion, and every attempt to extend it occasions smart pains. The situation of the olecranon, with respect to the condyles of the humerus,

merus, is changed. The olecranon, which in the natural state is placed on a level with the external condyle, which is itself situated lower than the internal, is higher than it.

This luxation may be mistaken for a fracture of the olecranon, of the head of the radius, or even of the inferior extremity of the humerus: such a mistake is attended with very bad consequences; for if the reduction be not effected before the end of fifteen or twenty days, it is impossible to accomplish it afterwards. Such was the case of a student of law, who fell down stairs and luxated his fore-arm backwards. The surgeon to whom he applied, thought he discovered a fracture of the head of the radius, and treated him as if a fracture had really taken place; but at the end of twenty days the error was detected, without a possibility of reducing the luxation. The swelling, more or less considerable, which supervenes in twenty-four hours after the accident, renders a diagnosis difficult; the bony prominences are so covered by it, that it is impossible to examine their respective situations. Besides, the rubbing of the coronoid process and olecranon against the humerus, causes a grating noise similar to that in fracture. From these circumstances it must appear, that much attention is requisite to establish a diagnosis between fracture of the head of the radius, and dislocation of the fore-arm backwards.

Different methods have been proposed to reduce this luxation of the fore-arm: some direct to place the elbow of the patient on a table covered with many folds of cloth; while the surgeon places his elbow in the bend of the arm, insinuates his fingers between those of the patient, and bending his fore-arm draws up the hand, and presses at the same time with his elbow on the inferior part of the humerus. But the force that can be applied in this way is inconsiderable; besides, the pressure forces the inferior extremity of the humerus against the luxated bones, increasing the friction and the difficulty of reduction. The same inconvenience attends the method which consists in placing the fold of the luxated arm against a bed-post, and bending the arm by means of an assistant, while the surgeon pushes the olecranon downwards and forwards.

The following method is by much preferable. The patient being firmly seated, an assistant seizes the middle part of the humerus, and makes counter-extension, while another assistant makes extension by drawing by the inferior part of the fore-arm; the surgeon, seated on the outside, grasps the elbow with his two hands, by applying the four fingers of each hand to the anterior part of the humerus, and the thumbs to the posterior, with which he presses on the olecranon, in a direction downwards and forwards. This method will be in general successful. If the strength of the patient, or the long continuance of the luxation, render it necessary to employ a greater force, a fillet is to be applied on the wrist to make extension, and a cushion is to be placed in the axilla, and the arm and trunk fixed as is done in cases of luxation of the humerus.

When the luxation is reduced, which is known by the noise the bones make in reassuming their situation, by the relative position of the processes, by the form of the part, and the facility of flexion and extension, long compresses moistened with a resolvent liquid, are to be applied to the elbow. They should be arranged obliquely, so as that their extremities may cross one another, and the whole form a figure of 8, which arrangement will prevent them from falling off. The fore-arm is to be neither much bent nor extended. A roller is to be passed tightly round the hand and fore-arm, in order to prevent an effusion of lymph. The laceration which always takes place, is accompanied with more or less inflammatory swelling, which is to be combated by blood-lettings, emollient cataplasms, anodynes, resolvents, &c.

At the end of seven or eight days, when the inflammatory symptoms are nearly gone, the articulation is to be gently moved, and the motion is to be increased every day, in order to prevent anchylosis, to which it is remarkably disposed.

In a luxation of the fore-arm backwards, the annular ligament which confines the head of the radius to the extremity of the ulna is sometimes torn, and the radius passes before the cubitus. In such cases the motions of pronation and supination are difficult and painful, though the principal luxation has been reduced. The head of the radius may be easily replaced, by pressing it from before backwards, and it is kept in its place by adding to the apparatus above described, a compress, which is to be applied to the superior and external part of the fore-arm. The bandage and compresses are to be taken off every two or three days, and re-applied: this precaution is very necessary, on account of the relaxation of the bandages, and the necessity of moving the articulation to prevent an anchylosis.

If the luxation be not soon reduced, it becomes irreducible; the superior extremities of the bones of the fore-arm grow to the humerus at its posterior part, and the patient can neither bend nor extend his arm. However, in some cases, especially in young persons, some motion is acquired in time; the heads of the radius and ulna make depressions in the humerus, and form for themselves cavities, in which they perform some motions, but always imperfectly.

The luxation forwards should be treated as a fracture of the olecranon, with which it would be inevitably accompanied. It may be necessary, on account of the great injury done to the soft parts, to bleed the patient copiously, and put him on an antiphlogistic regimen.

As to the lateral luxations, either inwards or outwards, they are always incomplete, and easily discovered. They are reduced by drawing the humerus and fore-arm in contrary directions, and at the same time pushing the extremity of the humerus and the two bones of the fore-arm in opposite directions. The extension and counter-extension diminish the friction of the surfaces of the articulation, and facilitate their sliding over one another.

These luxations cannot be produced without considerable violence; but when the bones are reduced, they are easily kept in their place. It will be sufficient to pass a roller round the part, to put the fore-arm in a middle state, neither much bent nor extended, and to support it in a sling. But much inflammation is to be expected, from the injury done to the soft parts. In order to prevent it, or at least mitigate it, the patient is to be bled two or three times, and put on a low diet, and the articulation is to be covered with emollient cataplasms. It is scarcely necessary to repeat that the arm is to be moved as soon as the state of the soft parts will admit of it.

SECTION II.

Of Luxations of the superior Extremity of the Radius from the Ulna.

The two bones of the fore-arm, articulated laterally by a double ginglymus, may be luxated from one another. But of these dislocations, of which the ancients make no mention, there is none more frequent than that of the head of the radius from the ulna. The superior extremity of the former may be forced before or behind the little sigmoid cavity of the ulna, destined to lodge a part of its circumference. They may take place instantaneously, from a violent and sudden effort, or gradually; and on account of this difference, they are divided into primary and secondary. We will treat first of the primary.

Though the superior extremity of the radius, in its different motions round the ulna, turns on its own axis, yet different observations prove that this extremity of the bone may be dislocated. The possibility of its luxation forwards, which ought to be rarer than that backwards, is easily conceived. The cause of the one being more frequent than the other may be this: the motion of supination, which must take place to produce luxation forwards, is less free and less extensive than that of pronation, in which the luxation backwards is effected; besides, the little sigmoid cavity in the ulna presents anteriorly on its margin a bony prominence, which prevents in some degree the head of the radius from passing on that side.

Many cases of primary luxation of the radius backwards are found in the work of Duverney. Citizen Boyer has met with it twice in a child of ten or twelve years of age. I have seen a similar affection, in a child of the same age, in consequence of a fall. In this luxation, the hand is in the state of pronation, and cannot be brought to its natural state, which is the medium between pronation and supination. The eminence formed by the head of the radius, instead of being felt under the external condyle of the humerus, is placed behind at the external side of the olecranon. A depression is felt at the superior and external part of the fore-arm. In order to reduce it, the left hand is to be placed on the elbow, so as to be able to push with it the head of the radius from behind forwards, and the patient's hand is to be taken by the other and brought towards supination, while the displaced extremity is pushed forwards. The noise heard at the moment that the extremity of the radius enters the sigmoid cavity, the remission of the pain, the change in the shape, and the facility of performing pronation and supination, indicate that the luxation has been reduced. The after-treatment consists in surrounding the part with compresses, wet with resolvent liquids, and in covering the entire limb with a roller.

The articulation should be frequently moved, but always very gently, as the annular ligament unites with difficulty, and only after a long time.

The secondary luxation of the superior extremity of the radius, arises from small efforts often repeated, which, without immediately displacing the bone, disposes it to relinquish gradually the sigmoid cavity. It takes place in young children. Nurses generally take children by the hand when they walk, to prevent them from falling; and when they are in danger of falling, support them by drawing up the arm with the hand in an overstretched state of pronation. The same is done sometimes to put them over a little stream, or even to carry them to a certain distance. The straining occasioned in this way, produces a dull pain, which each repetition of the practice increases. The child complains of this pain when the articulation of the elbow is pressed on. He makes less use of this arm than of the other, and if he receives a sweetmeat in the hand of this side, he passes it to the other to convey it to his mouth. In this state of the disease, it will be only necessary to avoid a repetition of the cause, and to apply embrocations to the part. If these precautions are neglected, and if the practice of raising the child by the arm be persisted in, the pain continues and increases; a swelling appears, in the pained joint; the superior extremity of the radius is carried backwards; the motions of the fore-arm are obstructed, and usually, in scrofulous children, the tumefaction of the joint increases; the extremities of the bones become carious; abscesses form, which either on breaking spontaneously, or being artificially opened, cause fistulous openings into the joint. Then the dislocation of the extremity of the radius is no more the principal disease; this consists of a painful swelling of the soft parts, and enlargement and caries of the ends of the bones. In the chapter on white swellings we will give the treatment of it.

SECTION III.

Of Luxations of the inferior Extremity of the Ulna.

We give this denomination to the dislocations of the inferior extremities of the bones of the fore-arm, which other authors describe under the name of luxations of the inferior extremity of the radius. Although this extremity moves on the ulna, yet, as the head of the latter evidently escapes from the sigmoid cavity of the radius, and as, in considering the affection as arising from this dislocation, it is easier to explain the phenomena of it, we have adopted this name in preference.

The inferior extremity of the ulna may be luxated anteriorly, or posteriorly, from the inferior extremity of the radius. The first of these luxations, of which we have but few examples, must be much less frequent than the second, because the excessive supination of the hand necessary to produce it is more difficult than its pronation. It is well known that it is in the state of pronation that the hand performs almost all its motions, and fulfils the greater part of the purposes to which it is adapted. In this luxation, the head of the radius rolls from before backwards, or from within outwards on the head of the ulna, and pushes it forwards; if the luxation take place rapidly, the ligaments between the bones will be torn, and the little head of the ulna will be forced before the inferior extremity of the radius. In this state, the hand is in a continual state of supination, and cannot be brought to that of pronation; a tumour is felt before the radius; there is an empty space where the inferior extremity of the cubitus should be; and this bone, instead of being parallel with the radius, crosses it obliquely at its inferior part. Reduction is easily effected. It is done by pulling the arm, and at the same time turning it a little inwards, whilst the head of the ulna is pushed backwards, and the extremity of the radius carried forwards, the person who extends the arm bringing the hand at the same time to the state of pronation. The noise made by the replacing of the bones, the disappearance of the deformity, and the facility of putting the hand in the supine or prone state, shew that the luxation is reduced. Compresses wet with resolvent liquids, and a roller passed tightly round the fore-arm, are all the apparatus that are necessary after the reduction; the hand is to be kept at rest and supported in a sling. This luxation, if neglected, would lead in a very short time to the loss of motion in the joint from an anchylosis.

Citizen Boyer has met a remarkable case of luxation of the cubitus anteriorly, which is extremely rare. A woman engaged in a riot, that took place in a coffee-house near the market-place of Saint Germain, was pushed out of the house by a man who twisted her hand violently in the supine direction; she felt horrible pain, and cried out that her wrist was breaking, and in the moment saw that a deformity supervened. Professor Boyer was called in; he found the hand fixed in the supine state, the fore-arm bent, and the hand supported before the breast. The oblique direction of the inferior extremity of the ulna which crossed the radius, was very remarkable. The reduction was accomplished only by the fourth attempt.

The luxation backwards of the inferior extremity of the ulna, described by authors under the name of luxation forwards of the inferior extremity of the radius, has been frequently observed. It is more frequent than the former, because the motion of pronation, by which it is occasioned, is more habitual than that of supination; and as luxation forwards is produced by a violent supination, so that backwards is the result of a violent and sudden pronation. Such was the case of the female mentioned in Desault's Surgical Journal, who luxated the cubitus backwards in wringing wet cloths; in doing which, the hands are put in the greatest state of pronation possible. The hand in this luxation is fixed in the prone state, is incapable of supination, and is a little inclined inwards. The ulna crosses the radius obliquely, but its little head forms a tumour behind the inferior extremity of this bone. It is reduced in the same manner as the luxation forwards, with this difference, that the hand is to be moved in a contrary direction. If the luxation has been neglected, and a swelling of the articulation has supervened, no attempt is to be made to effect a reduction until the swelling is discussed by means of emollient cataplasms; we should not however defer the reduction too long, as it often becomes impossible after a very short time. In the latter case, the person is not so much disabled in the luxation backwards, as in that forwards; the state of pronation being much more convenient for the purposes of the hand, than that of supination.

CHAPTER XI.

OF LUXATIONS OF THE HAND.

SECTION I.

Of Luxations of the Wrist.

FOUR kinds of luxations may take place in the articulation of the bones of the carpus with the inferior extremities of those of the fore-arm, viz. luxation forwards, backwards, inwards, and that outwards. But the two first, especially that backwards, are the most frequent, because the motions of flexion and extension are much more extensive than those of adduction and abduction, and because the extent of the articulating surfaces is greater from within to the outside, than from before backwards; besides, the styloid apophyses of the radius and ulna strengthen the external and internal sides of the articulation, and render dislocation in the transverse direction still more difficult.

The articulation of the hand with the fore-arm is remarkable in this, that it admits of flexion and extension nearly to the same extent; whilst these two motions, in all the other articulations, have rarely the same latitude, that of flexion being always the most considerable.

Luxation backwards is facilitated by the direction of the convex articulating surfaces of the scaphoides, semilunaris, and pyramidalis, which, inclined more backwards than anteriorly, must be more disposed to slide in this direction than in any other. It is caused by a fall on the back of the hand while much bent; in which case the first range of bones of the wrist slides backwards into the oblong cavity of the two bones of the fore-arm, extends and lacerates the posterior ligament, and forms an eminence behind the ends of the radius and ulna. This tumour, the depression at the anterior part of the wrist, and the extraordinary flexion of the hand which cannot be extended, are the distinguishing marks of this luxation. It is reduced by fixing the fore-arm, and drawing the hand, whilst pressure is made on the eminence formed by the displaced carpus to force it back into its cavity. An assistant fixes the arm, and the surgeon makes extension and adjusts the bones. Luxation forwards is

occasioned

occasioned by a fall on the palm of the hands, the fingers being extended, and more force being applied to the inferior part of the palm than to the superior. It is rarely complete; the hand remains painfully extended, and cannot be restored to its natural direction without some difficulty. The numerous tendons which pass before the wrist, and the annular ligament which confines them, being pushed forwards, render it so difficult to discover the eminence formed by the bones of the wrist before the ends of those of the fore-arm, that this affection may be easily mistaken for a sprain. Consequently, in all doubtful cases, we should proceed as if the luxation had really taken place, and bring the hand into its proper direction.

Luxations backwards, but especially those forwards, are always accompanied with a more or less considerable laceration of the ligaments, and are followed by an inflammatory swelling difficult to subdue; hence the full use of the wrist is not recovered for a considerable time. When the bones are reduced, the remainder of the treatment is the same as in cases of sprain: refrigerants and repellents are to be first used, and then emollients and resolvents. The patient must not fatigue the hand much, even for some time after complete recovery, lest he excite inflammation, and lay the foundation of a white swelling.

Luxations inwards, and those outwards, are never complete. The laceration of the ligaments, a tumour at the internal or external side of the joint, and distortion of the hand, are the concomitant symptoms of these luxations, and mark them out sufficiently. They are reduced by making gentle extension, and causing the two surfaces of the joint to slide on one another in a direction contrary to what they took in luxating, and by bringing the hand into its natural situation. The danger of these luxations depends less on the dislocation than on the straining and laceration of the soft parts, which are always followed by more or less tumefaction, a symptom difficult to subdue, and often the cause of anchylosis, or even of caries.

SECTION II.

Of Luxations of the Bones of the Carpus and Metacarpus.

The motions of the bones of the carpus in their articulations with one another are so limited, and their connexion is so strong, that a dislocation of them appears entirely impossible. However, the head of the os magnum, which is received in a deep cavity formed for it by the scaphoides and semilunaris, may escape from this cavity, be luxated backwards by too great a flexion of the bones of the first range on those of the second, and form a tumour on the superior part of the back of the hand. I have lately seen a remarkable case of this luxation. Mrs. B. in a labour pain, seized violently the edge of her mattress, and squeezed it forcibly, turning her wrist forwards; she instantly heard a slight crack, and felt some pain, to which her other sufferings did not allow her to attend. Fifteen days afterwards, happily delivered, and recovered by the care of Professor Baudelocque, she shewed her left hand to this celebrated accoucheur, and expressed her disquietude about the tumour which appeared on it, especially when much bent. I was called to visit this lady. I found that this hard circumscribed tumour, which disappeared almost totally by extending the hand, was formed by the head of the os magnum luxated backwards; I replaced it entirely by extending the hand, and making gentle pressure on it. As the affection did not impede the motion of the part, as the tumour disappeared on extending the hand, and as it would have been even little apparent in any state of the hand, had Mrs. B. been more in flesh, I advised her not to be uneasy about it, and to apply no remedy to it. Chopart observed a similar dislocation in a butcher. Professor Boyer's practice has presented him also a case of it.

As to the bones of the metacarpus, they are connected so closely and strongly, and support one another so firmly in efforts made against the palm of the hand, that they are never luxated. The ligaments of their articulations may, however, be overstretched and torn, and a painful diastasis produced, which will require the use of emollients and resolvents, with immobility of the hand as long as the affection continues.

Notwithstanding the mobility of the articulation of the trapezium with the first bone of the metacarpus, the latter is luxated but very rarely. Efforts made on the thumb, which is supported by this bone, would produce rather a luxation of the first phalanx, than that of the metacarpal bone. The second and third bones are so firmly articulated with one another, and with the bones of the second row of the carpus, that they are not susceptible of any luxation whatever. As to the fourth and fifth, a little more moveable, and supported by the os unciforme, their articulations are more susceptible of sprains than true luxations.

SECTION III.

Of Luxations of the Fingers.

The first phalanges may be luxated backwards at their articulations with the bones of the metacarpus. A luxation of them forwards would be very difficult, if not altogether impossible, on account of the disposition of the articulating surfaces of the metacarpal bones, which are much elongated forwards, and allow a great extent of motion to the phalanges in this direction, without losing contact with them; and on account of the resistance made by the palm of the hand, which would restrain the flexion carried beyond what the inclination of the articulating surfaces would admit of. Luxations inwards can take place only in the first phalanges of the thumb and little finger; as to that outwards, the first phalanx of the thumb alone is susceptible of it. This phalanx is also the most exposed to luxations backwards. When a violent effort is made on the thumb from before backwards, its first phalanx slips behind the head of the first metacarpal bone, and remains extended, while the second is bent, its flexor-muscle being thrown into action by the irritation. The distortion of the thumb, the impossibility of bending the first phalanx, and the pain, render this luxation sufficiently evident.

The more violent the effort necessary to produce these luxations, the more grievous are their consequences. In some persons in whom the ligaments are excessively relaxed, they produce no inconvenience. In such, the first phalanx of the thumb may be luxated at will; but then it is as easily reduced as displaced.

These luxations should be quickly reduced, for, at the end of eight or ten days, they are irreducible. Desault, in a case of this kind, proposed making an incision behind the superior extremity of the phalanx, and by means of it to introduce a spatula, in order to push the phalanx into its place; but the patient, frightened at the operation, would not submit to it. Citizen Boyer has also observed in a hair-dresser, a luxation backwards irreducible from having continued too long.

The reduction is not as easy as one might imagine. The number and force of the muscles which are inserted into the first phalanx of the thumb, and the little hold we can take of this part in order to make extension, render the reduction difficult. Luxations of the first phalanges of the thumb and little finger inwards, that of the thumb outwards, and luxations of the first phalanges of the other fingers backwards, are all reduced by making extension on the inferior extremity of the affected finger, round which a fillet is to be passed if there be occasion for much force. The wrist is fixed by an assistant, who makes counter-extension, and the surgeon replaces the bone. The first and second phalanges are also susceptible of luxation backwards, which only differs from the former by being more easily reduced. After the reduction is accomplished, a roller is put round the finger to prevent a return of the luxation.

CHAPTER XII.

OF LUXATIONS OF THE FEMUR.

The articulation of the femur with the bones of the pelvis is so strong and well secured, that luxations of it are not frequent; thus they are much rarer than those of the humerus, yet they are described by all authors, ancient and modern. But I am disposed to think that practitioners have often confounded primary luxations of the femur with fractures of the neck of this bone, which are much more common.

These luxations may take place upwards and outwards on the external face of the os ilium, upwards and forwards on the body of the os pubis, downwards aud inwards on the foramen ovale, and downwards and outwards on the os ischium. Hence their division, generally admitted, into four well-marked species.

Luxation upwards and outwards, and that downwards and inwards, are the most frequent; and it is not easy to ascertain which of these two takes place oftenest. No anatomical reason can be given for the frequency of the first *; the edge of the acetabulum projects more at the superior and exterior parts than at any other; the orbicular ligament, which is very thick at this place, and the interior ligament of the articulation, which must be previously ruptured, oppose the dislocation in this direction. There is little, on the contrary, to oppose the luxation downwards on the foramen ovale. The inferior and internal part of the circumference of the cavity, the place by which the bone escapes in this species of luxation, presents a deep notch formed into a hole by a ligament, under which the vessels of the articulation enter. The orbicular ligament is thinner here than at any other place; the motion of abduction, in which this luxation takes place, is more extensive than that of adduction; and lastly, the round ligament within the articulation does not oppose it, as it may take place without its being ruptured.

Luxation upwards and forwards is very rare; that downwards and backwards is still more so;

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* Except the disposition of the head of the femur, the articulating part of which, covered with cartilage, is continued farther upwards and outwards, than downwards and inwards.

and, perhaps, as shall be observed farther on, never occurs but secondarily.

When, by a fall from a place more or less elevated, on the soles of the feet, or on the knees, the thigh is pushed forwards and inwards, the head of the femur, forced towards the superior and external part of the acetabulum, breaks the internal and orbicular ligaments, escapes through the laceration in the latter, and ascends on the external face of the os ilium; but as the part of the os ilium immediately above and at the external side of the cavity, is very convex, the head of the femur soon abandons its first position, and slides backwards and upwards into the external fossa of the os ilium, following the inclination of the plane towards this fossa, and obeying the action of the glutæi muscles which draws it in this direction. The head of the femur, in ascending thus on the external face of the os ilium, pushes upwards the glutæus minimus, which forms a sort of cap for it; and the glutæus maximus and medius are relaxed by the approximation of the points into which they are inserted. The pyriformis is nearly in its natural state, the gemini, obturatores, and quadratus femoris, are a little elongated. The psoas magnus and iliacus internus are relaxed, as are also the other muscles inserted into the trochanter minor. If to this description it be added, that the orbicular ligament, torn at its superior part, is stretched over the acetabulum and covers it, an exact idea may be formed of the change occasioned in the surrounding parts by this luxation of the femur.

The affected thigh is shorter than the sound one: it is a little bent, and carried inwards. The knee inclines more forwards and inwards than the opposite one; the leg and thigh are turned inwards, and the foot points in this direction. The trochanter major is brought nearer the anterior and superior spinous process of the os ilium, and is at the same time elevated and carried a little forwards: the latter circumstance may be considered as the necessary consequence of the rotation inwards of the thigh. The natural length of the limb cannot be restored without reducing the luxation; the foot cannot be turned outwards, and any attempt to do so causes pain; but the inclination of the foot inwards may be increased. If the patient endeavours to walk, he extends the foot to put the top of it on the ground; and though the heel is raised, he is still lame; for the diseased limb remains always shorter than the other, and the pain occasioned by the attempt to walk renders progression still more difficult.

Luxation of the femur upwards and outwards has nothing in common with the fracture of the neck of this bone but the shortness of the limb. The easy rotation of the member outwards and inwards, &c. &c. preclude all possibility of confounding them, unless the surgeon be remarkably inattentive.

It is difficult to assign the cause of the foot and remainder of the limb being turned inwards in this luxation. It may be established as a general rule, that luxated members always take a direction determined by the elongation of the muscles of the side opposite that to which the luxated bone is carried: thus, in luxation of the arm downwards and inwards, the deltoides and infraspinatus muscles, lengthened by the separation of their points of insertion, move the elbow out from the body, and give the arm an oblique direction. In this case, the obturatores, gemini, and quadratus femoris, being elongated, the point of the foot ought to be turned outwards. This phenomenon depends perhaps on the external portion of the orbicular ligament which comes from the anterior and inferior spine of the os ilium; this portion, which is very thick, being elongated in the luxation outwards, draws the great trochanter forwards, and consequently turns inwards the entire limb.

The difficulty of reducing luxations of the thigh, from the strength and number of its muscles, renders every dislocation of which it is susceptible very distressing. The laceration and injury done to the soft parts are nearly as considerable as in dislocations of the ginglymoidal articulations.

To effect the reduction, the patient is extended on a table firmly fixed, and covered with a mattress which is to be tied to it; a sheet folded longitudinally is applied to the groin of the sound side, in order to make counter-extension. The middle part is applied against the superior and internal part of the thigh, and the two ends passed before and behind the pelvis, cross on the hip, and are held by a sufficient number of assistants. By this means the trunk is fixed, but there is nothing to prevent the pelvis from yielding to the extending force. To answer this purpose, another sheet folded in a similar manner is placed transversely on the spine of the os ilium, and its ends are brought horizontally before and behind the abdomen towards the hip of the opposite side, where they are held by assistants. This apparatus, similar to that placed on the point of the shoulder in a luxation of the arm, answers the same purposes, as it presses only on the superior part of the glutæus maximus and medius, and does not stimulate them to contract. The extending force is to be applied to the inferior part of the leg, in order to have it as far as possible from the parts which resist the return of the head of the femur. The number of assistants for making extension and counter-extension is to be proportioned to the exigences of the circumstances and the power of the muscles. The surgeon, placed at the external side of the limb, presses on the great trochanter, and when the head of the bone has been brought on a level with the acetabulum, he endeavours to force it into it.

The disappearance of all the symptoms, and especially the noise made by the head of the femur on re-entering its cavity, indicate the success of the operation. This success is seldom obtained without having previously made several fruitless endeavours, whether from not employing sufficient force to make extension and counter-extension, or from a spasmodic contraction of the muscles obstinately resisting the reduction.

When the bone is reduced, it is prevented from leaving its place by bringing the thighs together by means of a bandage placed above the knees. In the generality of cases, it will be advisable to take some blood from the patient, and confine him for a few days after the accident to a very low diet; and in all cases the hip is to be covered with emollient and resolvent applications, which may be kept on by means of the spica bandage for the groin. This bandage is well adapted to this use, but is not at all fit for keeping the luxated bone in its proper place, as its action is made too near the centre of motion. The patient should be particularly directed not to walk too soon, nor at any time to fatigue too much the affected joint. It remains always weaker than the other; the round ligament never unites completely, if even its reunion be possible. When the limb has not been left at rest for a sufficient length of time (twenty days at least), the pain can never be said to have entirely disappeared; it is revived by the slightest effort, and at length becomes permanent. The patient, however, does not complain much of the pain, but it is more than probable that it is occasioned by occasions lameness. The mode of progression of persons whose thigh is luxated in this direction may be compared to that of a mower: the elongated extremity, like the leg which the mower keeps forwards, describes a semicircular motion outwards.

All these symptoms taken together form a combination too striking to admit of error in our diagnosis, or to allow us to confound this luxation with any other, or even with fracture of the neck of the femur.

The prognosis is somewhat less unfavourable in this than in luxation upwards and outwards. The muscles, which might oppose the reduction, being all elongated by the very circumstance of the luxation itself, render the reduction easier: besides, the contusion of the soft parts is less considerable, and the round ligament is stretched, but not broken. It is reduced in the same manner as the other, except that the extension is to be made at first downwards and outwards, before bringing the limb to its natural direction.

Luxation upwards and forwards is much rarer than the preceding, and more than one practitioner has described it rather as possible than as having absolutely taken place. It has been also called luxation on the pubis, though it may be reasonably presumed that the head of the femur is removed so far from the acetabulum but in very few cases, and that it only advances near the ilio-pectinæal eminence. Desault met a luxation of this kind in a porter of the flour market: his foot slipped, and the leg and thigh were carried backwards, whilst a heavy burden was placed on his shoulders. His body was bent backwards, and the head of the femur, directed forwards and upwards, burst its capsule and triangular ligament, and passed under the crural arch into the fold of the groin, where it was easily felt through the integuments.

The whole extremity is turned outwards in this luxation: it is also shortened. The great trochanter, brought nearer the anterior and superior spinous process of the os ilium, is placed before that eminence; that part into which the psoas and iliacus muscles are inserted is raised up, and a tumour is formed by the head of the femur in the fold of the groin, which compresses more or less the crural nerves placed at the external side of the vessels of this name, and occasions dull pains, with numbness and even paralysis,

lysis, when the contusion has been very great; the knee, turned outwards, is also carried backwards. This sympton is particularly remarkable shortly after the accident has taken place; for if the dislocation has continued some days, the thigh may reassume its natural direction, and perform even gentle rotatory motions inwards, the direction outwards still continuing. It is proper to remark, with respect to the tumour formed by the head of the femur in the groin, that the psoas and iliacus muscles may, in fractures of the femur immediately under the little trochanter, bring forwards the superior portion of this bone, cause it to project in the groin, and form an eminence there which might impose on us, if we were not apprized of the possibility of such an event taking place.

This luxation is particularly dangerous, as it requires a combination of violent efforts to produce it, and as it necessarily must be accompanied with great contusion and lacerations. Nevertheless, in the case treated by Desault, the reduction, though difficult, was not followed by any serious accident; and the patient, at the end of fifteen days, had almost entirely recovered the strength and use of his limb.

The process for reducing it does not differ from that pointed out for the others.

Luxation of the femur downwards and backwards may, like that of the humerus inwards and forwards, be either primary or secondary. It is primary, when, in consequence of some effort, the head of the femur is forced from the acetabulum at its inferior and posterior part, and is placed at the junction of the os ilium and ischium; it is secondary, when it succeeds to the luxation upwards and outwards, the head of the femur, which was placed at first in the external iliac fossa sliding downwards and backwards, its passage in this direction being favoured by the bending of the thigh on the pelvis.

In these two cases, the head of the femur rests against that part of the ossa innominata where the os ilium and ischium join. The muscles which cover the posterior part of the articulation, such as the pyriformis, gemini, obturatores, and quadratus femoris, are raised up and stretched; the psoas magnus and iliacus internus are in a great state of tension, and this explains the turning of the limb outwards. When this luxation is primary, the extremity is lengthened; a hard tumour is felt at the posterior and inferior part of the thigh; the great trochanter, by descending, is removed farther from the spine of the os ilium, and the knee and sole of the foot are turned outwards; but if it be secondary, the thigh is much bent against the pelvis; the knee and sole of the foot are turned inwards, because the primary luxation has been upwards and outwards. Secondary luxation in this direction is much more frequent than the primary: in reducing it, the same rules are to be observed as in other species of luxations.

Whatever may be the species of luxation, we should always be certain that it is perfectly reduced before leaving the patient. To ascertain this, we ought to move the thigh in various directions, taking care at the same time to omit that motion which might reproduce the luxation.

When a luxation of the femur upwards and outwards has not been reduced, the thigh remains short, and becomes shorter every day, until the head of the femur has made for itself a kind of articular cavity in the surface of the external iliac fossa. The acetabulum lessens in size, or is entirely obliterated. The glutæus minimus is emaciated, and serves as an orbicular ligament to the new articulation. The head of the femur loses its spherical figure, is forced backwards, and its neck becomes shorter; the person is lame, and walks on the point of the foot. If the luxation is downwards and inwards, the foramen ovale becomes the new articulating cavity; the obturator externus, raised and pushed inwards by the head of the femur, becomes emaciated and ligamentous, and it and the glutæus minimus even sometimes ossify. The lameness arises in this case from the excess of length of the diseased limb, which always diminishes in size, in consequence of the muscles not being sufficiently exercised, or their action being impeded.

CHAPTER XIII.

OF SPONTANEOUS LUXATIONS OF THE FEMUR.

It is not, perhaps, without transgressing the rules of nosology, that these affections, which arise from a swelling or caries of the ends of the bones, have been ranked among the luxations of the femur. The dislocation, by some called spontaneous, by others secondary, is in fact but the symptom of a more grievous affection which always precedes it, and against which our treatment should be principally directed. The names spontaneous and secondary are well applied to it; the first, because it often appears to come of itself without any apparent cause; the second, because it is the consequence of another disease. This luxation, though much more common than the primary, has been unknown from the time of Hippocrates, who describes it by the name of disease of the hips (*morbus coxarum*) in two of his Aphorisms, to that of J. L. Petit; who, though he mistook its etiology, has nevertheless given a very exact description of it in the Memoirs of the Academy of Sciences for the year 1722.

Two principal varieties of secondary luxations are pointed out. In the one, the dislocation is occasioned by the swelling of the cartilages which line the acetabulum and cover the head of the femur, and by the enlargement of the cluster of glands in the interior of the articulation, and which have been a long time considered as destined for the secretion of synovia. In the other, it arises from caries of the circumference of the acetabulum or head of the femur. The same causes may occasion both varieties; they are either external or internal.

It is only lately that surgeons have admitted the possibility of secondary luxation of the femur from an external cause. It was generally believed that it could be produced only by internal causes, which, in fact, are the most frequent. But it is now clearly ascertained, that contusion of the cartilages and sebaceous cluster of glands of the joint from a fall on the feet, knees, or great trochanter, may occasion an inflammation and swelling of these parts, by which the head of the femur will be expelled from its cavity.

From whatsoever cause it arises, its most ordinary course is this: the cartilages and sebaceous glands, irritated by the external violence, or by a scrofulous, venereal, or scorbutic taint, become swelled; the cartilages grow soft, and degenerate into a greyish substance like lard; their sensibility increases, and pains, at first dull and slight, but soon acute and deep-seated, are felt in the diseased joint. The head of the femur, pushed outwards by the tumefaction, is gradually expelled from its cavity; and when it is on a level with the margin of the acetabulum, it is drawn upwards and outwards on the external iliac fossa, by the glutæi muscles, and but very rarely downwards and inwards on the foramen magnum.

If, on the commencement of the pains, the patient be extended on a plane, and the two superior and anterior spines of the ossa ilia put in a horizontal line, it will be found, on examining the affected limb, and comparing its length with the sound one, that it is somewhat longer than the other. This elongation increases as the disease advances, and is never so considerable as just at the period when the head of the femur, on a level with the edge of the acetabulum, is about to pass over it. At this moment, the luxation being complete, the head of the femur is carried away by the action of the muscles, and the limb is on a sudden shortened by several inches, except in the very rare cases in which the bone is carried downwards and inwards on the foramen ovale. Sharp pains are felt during the whole course of the disease; they may arise from the affection of the cartilages, or from the straining of the orbicular ligament. They have this very striking peculiarity, that the patient complains of them more in his knee than in his hip, which in the beginning of the disease might lead into error.

When the luxation has taken place, the extremity is much shortened; the knee and point of the foot are turned inwards; the great trochanter is brought nearer the spine of the os ilium; the leg is bent; in fact, all the symptoms of primary luxation upwards and outwards are evident. The part over the articulation swells and grows round; the skin is soon put on the stretch; the cellular substance swells and becomes thick, and the tumour puts on the appearance of a white swelling; in some time, a softness is felt at different points, which correspond to so many abscesses; these burst, and their openings degenerate into fistulæ. A matter, at first serous and without smell, flows from them; but its qualities are soon changed by the contact of the air; it becomes acrid, irritating, and so fetid, that the patient and those near him can scarcely bear the smell of it: this matter, taken into the system by absorption, produces hectic fever, marasmus, colliquative diarrhœa, and death.

On opening the body, the acetabulum is found filled by its cartilage, which is converted into a soft greyish substance; the sebaceous glands of the joint are also swelled; the substance of the head of the femur is altered, and its shape is more or less changed according to the continuance of the disease; collections of fetid pus are found in the interstices of the muscles, which are discoloured and diminished in size; and the os innominatum and the head of the femur are frequently carious.

Such is the exact history of the first variety of the disease. The progress of its symptoms is somewhat different from what is observed in that occasioned by caries; different appearances are also found by examination after death.

In the second variety, the pains are at first acute, and accompanied with swelling of the hip;

hip: considerable abscesses form in this part, which soon burst; a matter, at first inodorous, flows abundantly from them, but in a little time it is vitiated by the contact of the air, and the openings through which it passes degenerate into fistulæ.

The extremity, which was not sensibly elongated, becomes suddenly shortened*; the head of the femur mounts up to the external iliac fossa; and the patient, exhausted by the copious suppurations and hectic fever, is generally carried off. On opening the joint, it is found that the edge of the acetabulum has been destroyed to a greater or less degree by caries, that the cavity has been nearly effaced, and that the head of the femur has participated in the disease.

Both the varieties which we have just described may be induced even in a person enjoying good health and of a robust constitution, by a quick commotion of the hip, as happens from making a false step, by a fall on the soles of the feet, on the knees, or even on the great trochanter. A much less degree of the cause will produce them, if the patient labour under a scrofulous, venereal, or scorbutic taint. Scrofula has been so frequently the cause of them, that it has been supposed that they never originated from any other; but though it may be the most frequent cause, still cases are met in which its existence could not be suspected.

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* Sometimes a caries of the acetabulum is not followed by luxation of the thigh. Citizen Boyer met a case of this kind, in which the bottom of the cavity only was affected; the edges were sound. The pus made its way into the pelvis, and formed an abscess in the groin, which burst, and left a fistulous opening.

It may be objected by those who believe that an internal cause is absolutely necessary to produce the disease, that the contusion of the parts about the joint acts only as an occasional cause; that in luxations supposed to be produced by a fall on the great trochanter, the injury, by determining to the articulation, the principle which vitiates the humours, only develops a disease, the germ of which was contained in the constitution.

J. L. Petit, to whom we are indebted for the first accurate description of spontaneous luxations of the femur, gives the following explanation of the manner in which they take place.

"By a fall on the great trochanter, the head "of the femur is violently forced against the sides "of the acetabulum; and as it fills exactly the "cavity, the cartilages, synovial glands, and "round ligament, must receive a violent commotion, which will occasion obstruction, inflammation, and a deposition of matter: the "synovia, especially, will be accumulated in the "cavity of the articulation; the capsule will be "distended by it, and the head of the femur "gradually expelled until it is entirely luxated." A little reflection will shew the futility of this explanation: admitting even that the secretion of synovia was increased by the contusion, without any increase of the absorption of it, which is always proportionate to its secretion, and that this fluid accumulated between the neck of the femur and orbicular ligament distended this latter, still a dislocation would not take place; a dropsy of the joint would be the consequence; for the liquid could not expel a hard resisting body such as the head of the femur; and if the synovia accumulated between the neck of the femur and the ligament should become thick, it would tend more to confine the bone to its cavity than to displace it. Petit knew very well that there was a disproportion between the cavity and the head of the femur, but he was mistaken as to the cause of this disproportion, and as to the nature of the substance which filled the cavity, and expelled the head of the femur.

The prognosis in these luxations is always unfavourable; it is, however, more or less so, according to the age and constitution of the patient, the species of luxation, its continuance, and the cause which has produced it. If the patient be young and strong, the affection recent, and accompanied only by dull pains and inconsiderable elongation of the extremity, if there be no internal taint, and if the cause has been external, the danger is much less than if the patient were weak and exhausted, the disease of a long standing, and complicated with fistulæ, &c. &c. The prognosis is still more unfavourable when the luxation takes place downwards and inwards, the head of the femur being placed in the foramen ovale, and the extremity elongated. This species of luxation is fortunately very rare; the lameness in it, arising from the elongation of the limb, is much more troublesome than that arising from a shortness of it.

The principal object in the treatment of this disease, is to prevent the spontaneous luxation. If this once takes place, the danger increases, and the patient may consider himself happy if the head of the femur attaches itself to the portion of the os innominatum against which it bears, or, making a depression, forms a new articulation. Whenever, in consequence of a fall on the feet, knees, or great trochanter, a person feels, in walking, dull pains in the hip, or knee, he should be directed to keep the limb in the most perfect repose, until they entirely disappear. Unfortunately, there are few patients who will confine themselves to bed for a complaint apparently so trifling, or submit to the bleedings and strict regimen necessary in such a case. At the same time that means such as these are used, emollients and resolvents may be applied to the hip.

If a constitutional taint be suspected, our attention must be directed to it, and remedies given to combat it; thus we examine carefully if the patient labours under scrofula, which is characterized by the softness of the flesh, discoloration of the skin, swelling of the upper lip and sides of the nostrils, and enlargement of the lymphatic glands in some parts of the body, &c. &c. If it is discovered that scrofula has produced the disease without the co-operation of any external cause, or if it has given the predisposition, and a fall has been the occasional cause, tonics must be administered, such as good wine, bitter vegetable infusions, extract of bark, &c.: an issue is at the same time to be established at some distant part, to prevent the determination of the humours to the diseased joint.

A large blister, applied to the hip, and renewed every twenty-four hours, produces very good effects. It seems to determine to the skin the irritation that has taken place in the cavity of the joint, and the abundant serous discharge that it occasions, reduces the swelling of the affected parts; this discharge should be kept up by dressing the blistered surface with an irritating ointment. I have seen the best effects from a blister applied at the commencement of the disease; the limb, though somewhat elongated, was restored to its natural length by means of it.

When all the means we have recommended, with perfect rest, the use of blisters, or any other stimulant, such as moxa, have been used in vain, and the constitutional taint has not been subdued, then all our endeavours should tend to arrest the progress of the disease, by favouring the attachment of the head of the femur to the bones of the pelvis. For this purpose, perfect rest of the limb is absolutely necessary. The leg and thigh should be kept extended; without this precaution, the patient, from his natural tendency to bend the limb, in order to diminish pain, may give it such a direction that it will be entirely useless to him after his recovery. Lecat cites an instance of this kind: the patient having escaped the dangers of a tedious suppuration, recovered, but the femur was grown to the os innominatum, so as to form a right angle with it: thus, from having neglected the precaution of keeping the thigh extended, the limb was rendered not only useless but inconvenient, and the person enjoyed but very imperfectly the advantages of his recovery.

If, notwithstanding this treatment, abscesses form in different points of the tumour, they should be allowed to burst of themselves, in order that the admission of air into them may be retarded as much as possible; and if it be deemed necessary to open them, the incision should be very small, and the operation deferred as long as possible.

When fistulous openings are established, they should be dressed so as to prevent as much as possible the admission of air; and detergent injections, composed of barley-water, wine, and honey, a solution of alcali, or any other liquid more or less suited to the sensibility of the parts, should be thrown into the fistulous passages. The strength is to be supported, and every means used to resist the exhaustion occasioned by a long and copious suppuration. Mineral waters, extract of bark, or syrup of bark for very young children, and a nourishing and invigorating diet, are to be used with this view. If the suppuration diminishes, and a tendency to anchylosis is suspected, the thigh is to be extended as much as the pains will allow, and kept in that position by means of splints; these are necessary on account of the patient's constantly endeavouring to bend his thigh, in order to diminish pain. If the patient is young, the epoch of puberty is often favourable to him; the great revolution which the solids and fluids undergo at this period, proves serviceable; the diseased parts exfoliate, the fistulæ dry up, and the head of the femur attaches itself to some point of the os innominatum. We must not endeavour, by moving the limb, to establish a new articulation; for, by disturbing the head of the femur, the irritation might be renewed, the inflammation increased, and the anchylosis, a very happy termination of a disease in which the life of the patient is in so great danger, prevented.

Secondary luxation of the femur downwards and inwards on the foramen ovale, is less frequent than that upwards and outwards; however, many cases of it have been observed. A young man felt acute pains in his hip, which swelled considerably in a very short time; the limb became elongated, and was turned outwards; the knee and point of the foot were inclined in the same direction; the leg was half bent, and a tumour appeared at the superior and internal part of the thigh in the perinæum: a fluctuation being discovered in the tumour, it was opened, a great quantity of pus escaped, and the patient found himself relieved. The operator was applauded for his success, but the pus, at first benign, soon became fetid; the patient was exhausted in a short time, and died. On opening the articulation, Citizen Boyer found

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the acetabulum destroyed by caries, which had committed some ravages also in the head of the femur.

This luxation presents the same symptoms as the primary one in the same direction, and requires the same treatment as the secondary luxation upwards and outwards. When the patients recover by an anchylosis of the head of the femur with the bones of the pelvis, the lameness arising from the excess of length in the limb, is much more inconvenient than that resulting from its shortness.

CHAPTER XIV.

OF LUXATIONS OF THE PATELLA.

THIS bone, placed on the anterior part of the knee, may be luxated upwards, downwards, outwards, and inwards; but the two last only, properly speaking, merit the name of luxation. The patella in fact cannot be luxated downwards, and descend below the knee, but when the tendon of the extensor muscles of the leg is broken transversely: in which case, the tibia, in the flexion of the leg, will bring down the patella, and displace it in the same manner as it does the inferior fractured portion in a transverse fracture of this bone.

Luxation upwards may depend on a rupture of the inferior ligament of the patella. This substance, though very thick and strong, and the tendon of the rectus anterior and triceps muscles, of which it is only a continuation, are sometimes broken transversely; in which case, the muscles carry the bone above the condyles of the femur, as they draw up the superior piece in transverse fractures of it. It is easily seen, that the dislocation of the patella, in these two cases, is only the effect of the rupture of the tendon of the extensors of the leg, or of the ligament which unites it to the tibia.

Luxations inwards or outwards take place when the patella is violently pushed in one or other of these directions. Great relaxation of the inferior ligament of the patella may give a predisposition to them. Such was the case of the young man, the particulars of which are given by Citizen Itard, in the Medical Journal; the relaxation of the inferior ligaments was such, that the patellæ were luxated outwards by the slightest motion of the knees.

Of the lateral luxations, that outwards is the most frequent. This may arise from the internal edge of the patella projecting more than the external, which disposition is favourable to the action of the means by which it is pushed outwards, and from the extent of the articulating surface of the external condyle of the femur, which allows the patella to slide easily on it.

The external condyle of the femur, naturally more eminent anteriorly than the internal one, may be depressed; and this depression, whatever may be the cause of it, favours luxation in this direction. I have seen among the military conscripts, three cases of luxation of the left patella outwards, which appeared to depend on this cause. In these three individuals, from twenty to twenty-two years of age, the patella was placed at the external side of the condyle, without having, however, entirely deserted it; its anterior face was turned outwards, its posterior inwards; and its internal edge was placed anteriorly, and projected under the skin, and the external edge was directed backwards. The luxation had taken place in all during infancy. Nothing was easier than to replace the patella; it was done by relaxing the extensors of the leg and bending the thigh; but, unless confined to its place, it was soon again dislocated; pulled by the tendon of the extensors, and its inferior ligament, which had contracted an oblique direction, it slided along to the outer side of the knee.

A patient, at this moment in the hospital *Saint Louis*, labours under a luxation of the patella outwards, occasioned by a gun-shot wound

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in the neighbourhood of the knee; the bone is easily reduced, but quickly abandons its situation. In all such cases, the strength of the articulation of the knee is considerably diminished, and the whole extremity is reduced in size.

The patella is easily replaced, but difficultly kept in its situation. The latter purpose might be accomplished, by applying a bandage about the joint, the pieces of which, embracing the sides of the patella, would fix it on the anterior part of the knee. But how is the derangement of this bandage to be guarded against in the motions of the knee, and what is to prevent the patella from passing outwards? None of the persons just mentioned found it necessary to apply for surgical aid; they suffered no great inconvenience from the luxation, and, as it exempted them from military service, they were little anxious to have it remedied. Indeed, it is very probable that no treatment would have been successful in such cases.

Luxations outwards, produced by external violence, may be either complete or incomplete; it is seldom complete, as it requires a very considerable violence to force the patella entirely from the external condyle of the femur. A gentle flexion of the knee favours it very much; in this posture, the muscles, the tendon of which is attached to the patella, are relaxed, and the internal edge of the patella projects, and is favourably situated for the action of an external force impelled against it.

Valentin, in his Criticisms on Surgery, gives a case of luxation of this kind. The Duke de Coigni, in galloping in the streets, struck his knee against the wheel of a carriage, and luxated the patella outwards. He was carried to the house of Botentuit, an ignorant, but very celebrated bone-setter, who made many endeavours to reduce the luxation, but which were fruitless, on account of the position in which he placed the limb; he kept the patient on his feet, and made him extend his leg forcibly. Valentin, family surgeon to the Duke, arrived, and reduced the bone with the greatest facility, by placing the patient on a bed, extending his leg, and bending the thigh towards the pelvis.

A young man, in running in a room, knocked his knee against the corner of a trunk; the blow was so violent as to luxate the patella outwards. Citizen Sabatier was consulted; he endeavoured to reduce it, but met very great resistance.

Citizen Boyer was called in: by using much force he effected the reduction, but not without a great many attempts.

In luxations of the patella outwards, the patient feels very acute pain, and cannot bend his leg; the knee is deformed, the pulley of the condyles of the femur is felt through the skin, and the patella forms a tumour before the external condyle; instead of the faces of the patella being anteriorly and posteriorly, the anterior is become the external and the posterior the internal; the internal edge is turned more forwards than inwards, and the external is become nearly the posterior. This position of the patella has made some believe that it might be luxated by turning half over, that is, by placing itself perpendicularly before the pulley of the femur, with one of its edges, now become posterior, lodged in the groove of the pulley. Others have even admitted the possibility of a complete inversion, in which the posterior face of the patella becomes the anterior. But it cannot be conceived, that the extensors of the leg, and the inferior ligament of the patella, could allow such an inversion to take place; and if the patella was only half inverted, and one of its edges rested on the pulley of the femur, the points of contact would be so few, that it would slip into its natural position.

The symptoms of luxation inwards are nearly the same as those just described: there is this difference, however, that the tumour formed by the patella is placed internally. In both species, if called in before the swelling takes place, we can feel through the skin the two faces of the patella; the posterior, excavated, turned towards the femur, and the anterior projecting under the skin.

A complete luxation cannot take place without great relaxation of the inferior ligament, and tendon of the extensor muscles, or without very considerable external violence; in which case the luxation, easy to reduce, would not be the most dangerous symptom.

In every species of luxation of the patella, reduction is to be effected as soon as possible. It is done by placing the patient on a bed with the leg extended and the thigh bent. In this position the extensor muscles and their tendon, as well as the inferior ligament of the patella, are relaxed; and this bone may be moved and pushed with ease in the direction which the species of luxation requires. We think it is always possible to reduce the patella, without making an incision in the integuments, and introducing a spatula under the bone. This operation, though recommended, has never been performed, and never could, without bringing the patient into great danger.

The noise made by the bone in reassuming its place, and the disappearance of the symptoms, announce the reduction; the patient can now bend and extend the leg. The inflammatory swelling, which generally supervenes, is to be subdued by bleedings and topical applications. This treatment, with a few days rest, will be sufficient; after some time the knee is to be moved gently, to prevent a stiffness of the joint, which, without this precaution, is very likely to take place.

CHAPTER XV.

OF LUXATIONS OF THE BONES OF THE LEG.

The tibia, at its articulation with the condyles of the femur, may be luxated in four different directions; viz. anteriorly, posteriorly, and laterally to either side of the knee. The luxation backwards is always incomplete; it could not be otherwise without a very great laceration of the soft parts. It is as often secondary as primary, and in such cases it is a concomitant of white swelling, a disease much more grievous than the dislocation, and almost always requiring amputation.

Luxation forwards is still more rare than that backwards; the ligaments of the knee and the greater part of the tendons surrounding it, being placed nearer its posterior than anterior part, prevent the too great extension of the leg. Luxations inwards and outwards are the most frequent. They are always incomplete, on account of the extent of the articulating surfaces, and the strength of the parts surrounding the articulation. They take place from the femur being drawn either inwards or outwards, while the leg is fixed.

The luxation backwards is distinguished by attending to the following circumstances: it is impossible to extend the leg; the patella, closely applied to the pulley of the femur, forms an eminence, under which there is an empty space, and the inferior ligament is extended obliquely downwards and backwards; and a projection formed by the extremity of the tibia, is felt in the ham, &c. &c.

Symptoms of an opposite kind accompany the luxation forwards. Those inwards and outwards are easily known from the deformity of the joint. In the first, the external condyle of the femur is lodged in the internal cavity of the tibia, and the internal condyle projects, and forms a tumour at the internal side of the knee: the contrary takes place in the second. When they are complete, which is extremely rare, the tibia is carried entirely to the internal or external side of the femur. In every case of luxation the laceration of the ligamentous parts is so great, that the ends of the tibia and femur may be easily placed in their natural situations; there is scarcely occasion for even gentle extension and counter-extension. It happens sometimes, notwithstanding the extent of the articulating surfaces, that a return of the luxation takes place from the great laceration of the parts which should confine the bones. To prevent this, an apparatus similar to that used in fractures of the thigh is to be applied. Disagreeable symptoms, occasioned by the laceration of the soft parts, are always to be expected; our attention should be particularly directed to moderate and subdue them. The antiphlogistic regimen must be strictly observed, and the other means of preventing and subduing inflammation had recourse to. If the inflammation terminates in suppuration, the abscesses are to be opened by making a large incision. In general, large openings are to be made in abscesses seated in the neighbourhood of joints, to allow a free evacuation of the pus, which by stagnating might become acrid, and attack the cartilages of the joint; but, if the abscesses be formed in consequence of a caries of the ends of the bones, a very small opening is to be made, in order

CHAPTER XVI.

OF LUXATIONS OF THE FOOT.

THESE luxations are but seldom met with; the great violence necessary to produce them, and the difficulty of effecting them, account for their unfrequency. Before they can take place, the astragalus must be partially or totally forced from the quadrangular cavity formed for it by the two bones of the leg, and in which it is received like a tenon in a mortice. The sides of the articulation are strengthened by very strong ligaments, which go from the tibia and fibula to the os calcis and astragalus, and by the two malleoli. An external violence, it is true, may distend or even break these ligaments; but its force being almost entirely spent in producing this effect, will not be sufficient to force the astragalus from the cavity in which it is enclosed.

The foot may be luxated inwards or outwards, forwards or backwards, and the luxation in any of these directions may be complete or incomplete. Luxations inwards and outwards are the most frequent; the former however occurs more frequently than the latter: the internal malleolus not descending so low as the external, the astragalus has a less space to describe from without inwards, than in the contrary direction. It is occasioned by a violent abduction of the foot, and is easily known from the derangement of this part, the sole of which is turned outwards, and the back inwards; from the pain, and inability of moving the foot; and lastly, from the eminence formed below the internal malleolus by the astragalus.

In the luxation outwards, it is equally impossible to move the foot; the sole is turned inwards and the back outwards, and the astragalus forms an eminence below the external malleolus.

Luxations of the foot are always dangerous; their consequences may be so dreadful as to occasion death, and in very many cases they render amputation necessary. However, the prognosis is not always so unfavourable; for it is clearly proved, that many patients have recovered without any thing extraordinary having occurred during their treatment. This invalidates the general rule laid down by J. L. Petit, to amputate before twenty-four hours after the luxation. It is also now well ascertained that dislocations likely to produce the most mischievous consequences, have had a happy termination, and that this was the case, though the soft parts have been very much injured, the ligaments nearly quite ruptured, and the astragalus completely removed from the foot.

The reduction should be accomplished as soon as possible, in every luxation of the foot; if deferred, the inflammatory symptoms and swelling which supervene, will render it difficult and painful. To effect this, one assistant makes counter-extension by fixing the leg, and another draws the foot, whilst the surgeon pushes the latter part in a direction contrary to that in which it was luxated. If the luxation be inwards, the external edge of the foot must be depressed by elevating the internal, when it is found that the ligaments yield to the extension: the contrary is done in luxations outwards. The articulation is covered with compresses moistened with resolvent liquids; and splints which reach below the sole of the foot, are applied on the inside and outside of the leg.

Consequences more or less disagreeable are always to be expected, which may be moderated or even prevented by copious and repeated bleedings. Sometimes, notwithstanding the enormous derangement and laceration of the soft parts, no bad symptom succeeds, and the patient recovers with an unexpected rapidity; but in very many cases, violent inflammation supervenes, and quickly terminates in gangrene. In other cases, the inflammation terminates in suppuration, abscesses form and heal up, and the patient recovers. Sometimes, however, there is a caries of the ends of the bones conjoined with them.

The experienced practitioner is to judge, from the nature and violence of the symptoms, when immediate amputation is necessary. A great number of observations posterior to those of J. L. Petit, prove that, by following his instructions, we should often amputate a limb which might be preserved. It is also ascertained by experience, that the astragalus may be extirpated with advantage, when the laceration is such, that it is only attached by a few shreds of ligament. The tibia, in consequence of this extirpation, descends, and rests on the superior face of the os calcis, to which it grows, and the patient from sprain, in which the foot may be moved, though not without pain, however high the inflammation may be.

Contrary symptoms accompany the luxation forwards: the foot is lengthened, the heel is shortened, and the foot, much extended, cannot be bent, &c.

The reduction of both is easily effected; after which it will be necessary to use effectual means to prevent a relapse. The mode of treatment to be afterwards observed, for subduing the unfavourable symptoms that supervene, is the same as that pointed out for luxations inwards and outwards. When gangrene takes place in any luxation of the foot, we must defer amputating until its ravages are arrested. In cases where the inflammation is moderate, and the destruction of the soft parts not considerable, the articulation may be preserved; and to prevent a stiffness of the joint, the foot is to be moved as soon as circumstances will admit of it.

The very thick and short ligamentous substance which unites the astragalus to the os calcis, binds them so strongly together, that they follow one another in their motions, and form, as it were, but one bone. Hence they are never completely separated, even in the most desperate cases of luxation of the foot; but one or both of them may be luxated from the scaphoides and cuboides. The transverse direction of the articulation formed by these four bones, suggested to Chopart the ingenious idea of amputating only a part of the foot. But these luxations, less dangerous than the others, can be occasioned only by a violent effort, in which the anterior part of the foot is fixed, as happened in the two cases related by J. L. Petit: the foot was fastened in an iron grate, whilst the body was drawn backwards. The astragalus and os calcis may, under these circumstances, be luxated, but particularly the former, the head of which slides from below upwards, in the cavity of the posterior face of the scaphoides, and forms a tumour on the back of the foot. The inflammatory swelling renders it often difficult to ascertain this luxation. It is not easily reduced, even shortly after it has taken place. Citizen Boyer failed in a case of this kind, in which the head of the astragalus was luxated upwards and inwards, by a fall from a horse; but in some time the person felt no inconvenience from the affection, he could walk without pain or lameness, and nothing remained but the deformity occasioned by the tumour.

The other bones of the tarsus and metatarsus are too strongly tied together to admit of luxation. The phalanges of the toes cannot be luxated by external violence, on account of their shortness. However, the possibility of luxation of the first phalanx of the great toe from the first bone of the metatarsus may be easily conceived. It is not necessary to give here the rules to be followed in such a case. They consist in reducing the luxation, and amputating the great toe, when the state of the soft parts renders it impossible to preserve it.

CHAPTER XVII.

OF DROPSY OF THE ARTICULATIONS.

The synovial fluid, which lubricates the surfaces of all the joints, may be accumulated in such quantity in the capsule which secretes it, as to form a disease called by authors hydarthrus, or dropsy of the joint. Though the possibility of this accumulation taking place in all the articulations may be conceived, yet there is no well-attested instance of this happening in any of them but in the knee.

Dropsy of the joints seldom depends on a general affection of the system, and rarely co-exists with other dropsical affections, such as hydrothorax, ascites, and anasarca. It appears to be a partial affection, and to be produced by local causes, which act by destroying the balance between the exhalation and absorption of the synovia. The accumulation of this sero-albuminous fluid seems to arise in most cases from an increased exhalation, and not from a diminution of absorption. In fact, affections of this kind come on, in general, from violent exercise of the articulation, from fatiguing the ligaments, and from the repeated friction of its surfaces in too long and laborious exercise.

Motion, as we have established in another work, is the principal stimulus by which the secretion of the synovia is increased, and the fluids determined to the joint. This determination is considerable in proportion to the friction and pressure of the ends of the joint against one another. When this stimulus is carried to a certain degree, an active exhalation, or rather slight phlogosis, is produced, and the serous secretion is very considerably increased. It is in a similar way that dropsies of the breast and abdomen are often occasioned by a slow and latent inflammation of the pleura or peritoneum.

The nature of the remote causes of hydarthrus corroborates what we have advanced concerning its formation. It is very often a consequence of acute rheumatism, and sometimes forms a crisis of that disease. Many observers, and particularly Storck, have remarked the tendency which acute rheumatism has to terminate by an effusion of a sero-lymphatic fluid into the cellular substance in the neighbourhood of the joints of the lower extremities, or into the interior of the joint itself. The more rapid the progress of the inflammatory symptoms, the more prompt is the effusion, consequently it takes place slowly in chronic rheumatism and in chronic gout. The swelling of the joints in these complaints, and the deposition of matter which takes place into the parts about the articulation, may also produce an increased exhalation of synovia. The pains which accompany white swellings often occasion an accumulation of synovia in the capsule of the joint. I have seen, in dissecting two of these swellings of the knee, the synovia collected nearly to the quantity of two ounces.

But we must remember that the inflammation which produces dropsy of the joint is only slight; if very considerable, it would suspend the secretion of synovia, and give riseto anchylosis by the mutual adhesion of the dried surfaces of the joint. We are decidedly of opinion, that the articulation of the knee only has hitherto presented a collection of synovia sufficient to merit the name of dropsy: such an accumulation never takes place in the hip joint, though J. L. Petit attempts to explain spontaneous luxations of the femur from this cause.

We must not confound this disease with encysted tumours, which are sometimes formed on the sides of the knee near the patella. The latter are circumscribed, and a fluctuation is felt in them; they are not accompanied with pain or discoloration of the skin; on opening them, an albuminous fluid escapes, and the sides of the cyst are made to adhere to one another by pressure; or when this does not succeed, by means of an irritating injection, which excites an inflammation on its surface. This practice is free from danger, because the cyst is shut on all sides, and has no communication with the interior of the joint. We must also take care not to confound with dropsy of the joint certain white swellings, in which the cellular substance, distended with fluid, presents a kind of fluctuation. This symptom is particularly apt to lead into error in swellings of the cluster of lymphatic and sebaceous glands situated above the patella, between the tendon of the extensor muscles of the leg and the anterior and inferior part of the femur. In the commencement of some white swellings, this tissue, distended with lymph, elevates and pushes forwards the tendon of the extensors of the leg, displaces the patella, and raises it up from the condyles of the femur. In these cases, the patella is replaced by pressure, and the swelled mass being displaced, forms two tumours at the sides of the tendon, which are tense and elastic, and have an internal motion; but the sensation communicated by this motion is very different from that occasioned by the undulation of a fluid: it is like that of something slipping from under the finger. However, there is such similarity in these symptoms, that an inattentive surgeon may be easily led into error.

Arthritic, œdematous, and white swellings of the knee, and foreign bodies formed in it, are accompanied with symptoms so different from those of dropsy of this joint, that there is no occasion to point them out here. The marks by which the existence of the latter affection is ascertained are these: a dull pain is felt in the articulation; the knee loses its oval form, and presents an irregular colourless tumour, in which a fluctuation is felt at those places where the capsule is slack, and forms little round eminences which project about the joint. The most considerable of these are placed at the sides of the patella, which is itself pushed upwards by the fluid, but it may be replaced by bending the leg.

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The form of the tumour is varied by the motions of the knee; but it always projects more at the anterior part of the articulation than in the ham, at which place the synovial membrane presents only a small surface, and is supported by the cross ligaments which pass behind it. A fluctuation is felt by striking the tumour; the thinness of the soft parts renders it very easy to ascertain the undulation of the fluid. The nature of the disease is sufficiently manifest when all these symptoms are present.

The prognosis is unfavourable, on account of the difficulty of discussing the tumour, and the danger of a caries of the cartilages and ends of the bones, or an anchylosis, supervening.

As dropsy of the knee-joint never depends on the causes which produce general dropsy; and as, instead of appearing in persons labouring under general debility, it is always met with in the strong and robust, a particular mode of treatment is required in it. Stimulants, purgatives, diuretics, or sudorifics, are either useless, or at least can give but a very feeble assistance. It is from topical applications that benefit is to be expected. The mildest of these are to be commenced with, and they in general succeed in recent cases, in which the effusion has not been considerable, and has been suddenly formed in a crisis of acute rheumatism, or any other acute disease. Resolvent liquids, such as camphorated spirit of wine, frictions with a brush, or warm flannel impregnated with some aromatic vapour, with volatile camphorated liniment, alcohol, ether, or even with mercurial ointment as advised by Bell, determine the fluids to the skin, increase the insensible perspiration of which it is the organ, and promote the absorption of the effused fluid. Fumigations with the vapour of vinegar, from which Monro witnessed good effects, with the vapour of benzoin and other balsams, and pumping with warm water in which neutral salts have been dissolved, act in the same manner. But of all topical stimulants, the most active and most effectual is a blistering plaster, in which the proportion of cantharides is not so considerable as to cause great vesications. Tralles used synapisms, and Storck applied cataplasms of the ranunculus. We must, however, take care not to carry the use of these remedies so far as to disorganize the structure of the cellular tissue, which often occasions ulcers difficult to cure, and extremely painful. For the same reasons we are not to use cupping and scarifying but with great circumspection.

When all these means have been used for a sufficient time without any benefit, and when the tumour impedes the motion, and causes a contraction and atrophia of the limb, we must have recourse to a surgical operation. It consists in making a puncture with a trocar into the cavity of the tumour, and allowing the water to escape through the canula. This operation, though easily performed, is a delicate and dangerous one, on account of the admission of air into the joint. The contact of air has not, as we shall see in treating of wounds of the articulations, all the bad effects attributed to it by authors. However, the morbid state of the synovial membrane, and the irritation already existing in it, may render it more sensible to the impression of this fluid than it would be were there no disease in the joint; and, in fact, cases have occurred in which the qualities of the synovia were considerably changed by the contact of air: this fluid, instead of being inodorous, acquired a disagreeable odour, lost its transparency by the mixture of a purulent matter, produced an inflammation which extended to the capsule and cartilages, and at last occasioned a caries of the ends of the bones.

To prevent these direful consequences, and the introduction of air which occasions them, a superficial incision is to be made in the skin at the most projecting part of the tumour; after which, the lips of the wound are to be much separated, and the trocar used in the operation for the hydrocele, pushed cautiously in an oblique direction from the bottom of the incision into the cavity of the tumour. The skin, collapses after the evacuation of the water, and covers the puncture made by the trocar, the canula of which is to be drawn away when all the water has drained off.

When the operation is finished, the patient is to be put to bed with his knee half bent; the joint is to be covered with cloths wet with spirituous liquors, or other astringent fluids, with the view of preventing the return of the effusion. We will mention, in the chapters on white swellings and anchylosis, the treatment to be adopted in cases in which the synovia has its qualities changed, and produces caries or anchylosis.

stances, but it is certain that they always impede more or less the motion of the joint in which they grow. Sometimes they succeed to the swelling and contusion occasioned by a fall or blow on the knee; at other times they are formed spontaneously without any apparent cause; and in both cases their presence is indicated by tumefaction of the knee, which is increased by rest, and diminished by moderate exercise. Are they formed by the crystallization of the salts held in solution by the synovia, in the same way as the crystallizable parts of the urine form calculi in the bladder? How, in this case, do they become organized? for many of them have vessels, and evident marks of organization. Theden supposed that they were formed by a portion of the synovial cluster of glands on the outside of the capsule, which was bruised and nearly detached by the shock occasioned by a false step. Some authors have imagined that they were portions of cartilage detached from those covering the ends of the bones, or placed between them. Morgagni ascertained that they could not originate in this manner, for the articulation and cartilages were perfectly sound and whole in the subjects in whom they were found in the greatest number. Nothing then is more obscure than the etiology of this affection. Happily, ply, though its causes are involved in obscurity, it is easily distinguished, and can be treated with great hopes of success.

If these substances are free and detached, they can pass easily from one part to another of the articulation, and enter into all its corners; in this case, it is difficult to establish the existence of them, but it is particularly difficult to extract them; the moveable body, whilst we are making the incision to extract it, may slide from the place where it projected under the skin, and fall into the cavity in the posterior part of the knee. Sometimes it occasions no pain: this arises from the body being fixed in some place in which it does not impede the motion of the knee; as, for example, at the sides of the patella, or of the tendon of the extensors of the leg. At other times it occasions much distress: this is caused by its being placed between the posterior face of the patella and the articular pulley of the femur. As it can occupy alternately these different places, it is easy to explain, as Bell observes, why patients affected with this complaint are often roused from their sleep by sharp pains arising from the change of situation of the body during sleep.

A more or less considerable enlargement takes place round the knee during the continuance of the pains, but it is still easy to feel the body through the skin and capsule. It forms an eminence under the integuments, and may be pushed in any direction, and made to project at the internal or external sides of the inferior ligament of the patella, at the internal or external sides of this bone itself, or of the tendon of the extensors of the leg. Sometimes the laxity of the integuments and capsule is so great, that we can seize the body and twist it. Desault has seen a case of this kind.

It is impossible to obtain a resolution of these substances. This desirable termination cannot take place but by means of vital action; now, this action is so little to be expected in the greatest number of them, they being in some degree inorganic, and topical stimulants and resolvents can act with so little effect through the integuments, that the removal of them by these means is scarcely to be looked for. Some English surgeons have proposed to fix and confine the body in a part of the articulation where it could not impede motion, and where it might form an adhesion with the capsule; but how are we to confine a body which tends incessantly to change its situation? Besides, the adhesion cannot be formed without a certain degree of inflammation in both surfaces, of which the foreign substance is very rarely susceptible. Lastly, should the adhesion, which requires a certain degree of organization in the body, take place, the concretion would be susceptible of growth, and in time would impede, by its size, the motion of the knee.

The most simple, prompt, and certain method of cure, is the extraction of the foreign body; an operation always easily performed, and free from danger, if the following rules are observed. The patient being stretched on his back, with the leg extended, in order to relax the soft parts at the anterior of the articulation, the surgeon looks for the foreign body, and bringing it to the internal side of the patella, at which place the capsule is very lax, fixes it with his thumb and forefinger. An assistant draws outwards the skin over the patella, and the surgeon makes a longitudinal incision, through the integuments, on the body. The incision should be made deep enough by one stroke of the knife, and proportioned to the size of the body to be extracted. Sometimes it is forced through the incision by compressing it between the fingers. If it be attached by a fold of the capsule, which serves it as a ligament, this is to be divided with a bistory or scissars; if there be occasion to enlarge the incision, it is to be done with the knife; and pincers, or other instruments which may lacerate, bruise, or occasion inflammation of the surfaces of the joint, are never to be introduced. The substance being extracted, the assistant removes his hand, and leaves the skin to its own elasticity, which brings over the wound in the capsule the portion of the integuments which had been drawn to one side.

By making the incision in this way, the admission of air into the joint is prevented, and all the bad consequences, such as inflammation, suppuration, and caries, are obviated.

After having extracted one, or as many bodies as may be found in the articulation, the lips of the wound are immediately brought together by means of adhesive plaster; some compresses, wet with resolvent liquids, are applied over the joint, and the whole dressing is supported by some turns of a roller drawn pretty tight. The leg is to be placed on a pillow, and kept extended, in order to relax the soft parts about the incision, and thus prevent pain and the approach of inflammation.

Though the precaution of making the incision in the skin, in a line different from that in which it is made in the capsule, is rational, yet it is not absolutely necessary to the success of the operation. Many surgeons have omitted it, and afterwards obtained the immediate union of the divided parts; which proves, as will be mentioned in treating of wounds of the joints, that wounds of the articulations are attended with less danger than the ancients and a great number of the moderns have imagined. The pain occasioned by the extraction is inconsiderable, but it may be acute, if the patient be extremely sensible to impressions, or if a considerable branch of the internal saphena nerve, which is very variable in its direction, come under the edge of the bistory. The loss of blood, when even one of the articular arteries is divided, is very inconsiderable; it scarcely merits the name of hæmorrhage, and is easily stopped by bringing together the sides of the wound. For some days after the operation, the compresses should be frequently moistened with resolvent liquids, and the knee kept perfectly at rest; the patient should not be permitted to rise before the fifteenth or twentieth day, though the wound may have cicatrized in the first week; for it is much better, in these cases, to carry precaution too far, than to be deficient in it.

When, on account of the admission of air into the articulation, or the improper use of instruments in extracting the body, inflammation takes place, it is combated by emollient applications and copious and repeated bleedings. If abscesses form, they are to be opened; and when the symptoms have abated, the limb is to be gently moved, and the motion increased every day, in order to prevent a stiffness of the joint. All the observations that we have made here respecting these bodies are applicable to those only found in the knee; and this is the only joint on which it has been necessary to perform an operation in order to remove them. Their presence in other articulations would not be so easily discovered, neither would it cause the same inconveniencies. Should extraction, in these cases, be necessary, the operation would be so much the more dangerous, as the joint is deep-seated, and surrounded with important parts.

CHAPTER XIX.

OF WOUNDS OF THE ARTICULATIONS.

ALL the ancient writers on surgery speak in the same terms of the danger of wounds of the articulations; and almost all modern authors are of their opinion. We will prove, in this chapter, that wounds of the articulations, sometimes followed by serious consequences, often heal with the greatest facility, and that the apprehensions of authors respecting them are unfounded.

A man was wounded in the elbow by a piece of glass, which penetrated into the cavity of the joint. The glass was extracted, and the lips of the wound were brought together, and supported by adhesive plaster; his recovery was quick, and not interrupted by any unfavourable circumstance

Another man was wounded by a small sword in the same joint; he was carried to the hospital *de la Charité.* On examining the wound, it was found that the capsule of the joint was opened. This wound healed like the most simple puncture.

As the practitioners of all ages have agreed in referring the danger of wounds of the joints to the admission of air, the facility with which punctured wounds of the articulations heal, may be accounted for from the narrowness of the wound, and the difficulty opposed to the insinuation of air. But experience also proves, that wounds of the joints, by cutting instruments, are not very dangerous, though the admission of air into them is manifest.

A *Massacreur* of the second of September, who seized by the hair a prisoner of the *Abbaye Saint Germain,* received on his wrist the blow levelled at the head of the victim. The posterior part of the articulation was entirely opened, and the convexity formed by the scaphoides, semilunaris, and pyramidalis, abandoned the ends of the bones of the fore-arm. He was admitted into the hospital *de la Charité*; the lips of the wound were immediately brought together; the hand was kept much extended by means of a splint; the skin, tendons of the extensor muscles, and the capsules, all healed by the first intention, and, at the end of twelve days, he was discharged, quite cured.

A boy employed in the kitchen of the hospital *de la Charité*, had the articulation of his wrist opened by a piece of a vessel of delph ware; the lips of the wound were brought together, and the patient recovered in a very few days.

A shoemaker's wife opened with a sharp cutting instrument the articulation of her wrist on the external side, for about one third of its circumference; the tendons of the radiales externi, extensores, and long abductor of the thumb, were divided. Citizen Boyer was called in; he closed the wound, which healed by the first intention, and was cicatrized on the third day.

The facility with which the incisions made in the joints for the purpose of extracting foreign bodies, heal, proves also that wounds of the articulations are not attended with so much danger as has been generally supposed. But though the excite inflammation. When this practice is not successful, we must combat the inflammation, open the abscesses, prevent the stagnation of the pus by making counter-openings; and, lastly, amputate the limb, when preserving it brings the patient's life in danger.

CHAPTER XX.

OF WHITE SWELLINGS OF THE JOINTS.

The name of lymphatic tumour, or white swelling, has been given to swellings of the joints, unaccompanied with symptoms of inflammation. Such is the definition of them given by Bell in a Dissertation on White Swellings, at the end of his Treatise on Ulcers. In fact, an increased heat and discoloration of the skin are never observed, at least in the beginning of these swellings; there is simply a tumefaction of the part, with pain more or less deep seated. The English author just mentioned has very justly marked out two principal varieties of this disease.

In the first, called rheumatic, the patient feels dull pains in the whole of the limb, before the appearance of the tumour, which is often a critical termination of rheumatism. The pain now becomes fixed in the joint, and diminishes in violence; the soft parts surrounding the articulation swell more or less; but there is no change in the colour of the skin, nor is there an increase of heat. If the disease be seated in the knee, the patient keeps the leg more or less bent, in order to relieve pain; the muscles, tendons, and even soft parts, from remaining in this contracted state, become stiff, and hence results contraction or rigidity of the limb, or even a complete anchylosis. The pains increase by degrees, the swelling augments, and distends the skin; inflammation takes place, which terminates in suppuration, and the formation of abscesses in the cellular substance; these burst spontaneously, and leave fistulous openings. Through these fistulæ flows a whitish or serous matter, at first inodorous, but it is soon vitiated by the contact of air, and becomes fetid. The disease extends its ravages from the soft parts to the cartilages and ends of the bones. The leg is considerably diminished in size; this may depend on the impediment to the distribution of the fluids, by the pressure made on the vessels by the enlarged and indurated parts; or rather on the swelled joint drawing to itself most part of the fluids, and thus diminishing the quantity which should go to nourish the leg. The immobility of the limb tends also to diminish the nutrition of the leg, since it is found that the emaciation extends to the inferior part of the thigh. The skin, excessively distended, becomes inflamed and ulcerated; the veins become varicose, and burst; and the patient, exhausted by the continuation of pain, and the absorption of purulent matter, drags on a miserable existence for some time, and dies.

The course of the disease is described here as it takes place in the knee, which is its most usual seat; but the articulations of the elbow, hip, wrist, and foot, are by no means exempt from it.

On dissecting the diseased joint, the soft parts are found indurated, decomposed, and in a confused, grayish mass, somewhat resembling lard. The swelled ligaments form one body with the cellular substance; the cartilages preserve, in some cases, their natural colour; in others, especially when the affection has continued long, they and the ends of the bones are affected with caries. The cellular tissue placed behind the inferior ligament of the patella, between the femur and the tendon of the extensors of the leg, in the ham, and behind the cross ligaments of the knee in the interval between the condyles of the femur, has also the colour, appearance, and consistence of lard. In some cases, collections of a bad purulent matter are found in different parts of the cellular substance.

The white swelling produced by a scrofulous taint, which establishes itself in the great articulations, has sometimes an appearance, and pursues a course similar to that just described; at other times dull, deep-seated, and circumscribed pains precede it, and announce its formation. The swelling is at first scarcely perceptible, and when it becomes more considerable, it is perceived that it arises almost entirely from an augmentation of volume in the ends of the bones, and that the integuments scarcely participate in the morbid state. The limb becomes emaciated and contracted, the pain appears confined to the centre of the joint, and to the extremities of the bones; emollient and anodyne applications neither appease the pain, nor produce a resolution of the swelling; lastly, the patient, exhausted by his sufferings, perishes. On opening the knee, every part is found in a natural state, except the cartilages, and ends of the bones, which are affected with caries.

It would be too tedious to describe the different forms under which this disease may present itself;

after pointing out its two principal varieties, it will be sufficient to remark, that it differs so much in different individuals, that it is scarcely accompanied by the same symptoms in two patients.

White swellings are sometimes produced by rheumatic affections; but most generally they originate from a scrofulous taint. They seldom appear to be produced by an external cause, though they sometimes follow strains that have been neglected, or badly treated, and fractures in the neighbourhood of the joints. Sometimes the swelling comes on rapidly without any apparent cause. Such was the case of a young man, whose arm I have lately amputated for a white swelling, and caries of the elbow joint. Lastly, a blow, fall, or any external violence, may produce the swelling in a scrofulous person, in whom the cause of the disease seems to be easily called forth.

The enlargement of the ends of the phalanges, considered by some authors as a species of spina ventosa, belongs to the class of white swellings. This disease, as has been already observed, affects both the substance of the bones and their articulations.

The prognosis is always unfavourable, whatever may be the age or constitution of the patient, the cause or duration of the disease. The tumours are very seldom discussed; they almost uniformly resist the numerous remedies with which they are combated. In some fortunate cases, the disease, arrived at a certain pitch, makes no further progress; the pains diminish, and in time disappear; the limb remains contracted; the ends of the bones grow to one another, and the patient escapes death, but has an anchylozed joint.

In the greater number of cases, the patient, harassed by violent pains, is exhausted by the copious suppuration, hectic fever, and colliquative diarrhœa, and no resource is left but the amputation of the affected parts. The prognosis is somewhat less unfavourable in cases of children who have not yet attained the age of puberty. This period, so favourable for the cure of scrofula, brings about also that of white swellings, by destroying the evil which is its most frequent cause.

The diseases the most difficult to cure, are those in which the greatest number of remedies have been used; we must not then be astonished at the multiplicity of means proposed for the cure of white swellings. These, whether adapted on rational principles, or recommended empirically, must be adapted to the variety of the disease, and the stage in which it exists.

The limb must be kept perfectly at rest: without this precaution, the remedies cannot produce any good effect; for the motion of the affected parts augments the primary cause of the disease. Thus, in white swellings of the knee, the patient should remain in bed, with his leg as much extended as the pains, and tendency which he has to bend it, will permit. If he be young and vigorous, and if an external cause has produced the disease, or contributed to its development, or if it has been occasioned by a rheumatic affection, some blood may be taken away in the beginning of the disease. The aliments should be mild, and taken in small quantities at a time; the drinks should be refrigerant and copious; and the diseased joint should be covered with an emollient cataplasm, which is to be renewed twice a day. Such are the means for subduing the inflammation which is in some degree latent in the joint; to these may be joined the application of leeches, or even scarifications, which Bell prefers, and by which he says we may draw away at once eight or ten ounces of blood. When the pains diminish, and the tumour tends to a resolution, the emollients are rendered somewhat repellent; a cataplasm made of the root of briony boiled in milk may then be applied with advantage. Black soap, brought to the consistence of a liniment by means of camphorated spirit of wine, has been also employed with some benefit. Frictions about the knee, with a volatile liniment, composed of an ounce of oil and half an ounce of ammonia, have been found useful. The joint is to be rubbed twice a day with this liniment, and afterwards covered with a piece of fine linen that has been soaked in the same substance.

Mild laxatives, such as tamarinds, cream of tartar, dissolved in whey, or different laxative salts, dissolved in veal broth, are to be administered at the same time. They cause a determination of the fluids to the intestines, and thus divert them from the diseased articulation. Lastly, when the irritation and inflammation are abated, the most active resolvents are to be used. Blisters are then applied to the articulation, and sometimes the blistered surface is made to suppurate, and the discharge is kept up by a stimulating ointment. Bell recommends, strongly, frictions, with mercurial ointment, which have, he says, the double advantage of introducing into the system a powerful solvent, and increasing the action of the skin. They are to be frequently repeated every day, and continued until the mouth is gently affected.

Ledran, and many other practitioners, have advised to pump warm water on the affected joint. To derive from this practice its full effect, the water must fall from an elevated place, be used as warm as the patient can bear it, and be rendered stimulant by a neutral salt, or an alcali, dissolved in it. It is in this way that pumping is used in the hospital *Saint Louis*, which contains a greater number of patients labouring under white swellings than any other hospital in Paris. The mineral waters of Barèges and Bourbonne, &c. may be used in a similar manner. Warm baths, of a diluted alcaline solution, and vapour baths of the same solution, have been recommended. Much benefit is said to be derived from a kind of animal bath used in the following manner: the patient introduces the affected joint into an opening made in the belly of an animal recently killed, and keeps it for some time among the warm intestines. The mild temperature and unctuosity of this bath, produce an effect similar to that obtained by folding the omentum of a sheep round the joint, as recommended by Bell.

Very violent means, such as the actual cautery, and burning with moxa, often produce a diminution of the swelling; but some enlargement still remains, and the pain becomes intense. By such powerful stimulants, the state of the patient is rendered more distressing, his disease is aggravated, and its progress is accelerated.

When the treatment is successful, the joint remains for a length of time incapable of motion, and very often anchylozed. But the incapability of motion must not be always considered as a certain mark of anchylosis; it often depends only on the stiffness of the soft parts, and particularly of the tendons. This may be remedied in time, by moving the limb every day, and gradually increasing the motion; and by the use of warm baths, pumpings, and fomentations. However, all interference whatever should be abstained from, when there is a suspicion that the ends of the bones are unsound, or anchylozed; endeavours to move the limb, in such cases, would cause so much irritation as to reproduce the primary affection.

In cases where the white swelling is evidently scrofulous, the antiphlogistic plan cannot be pursued; tonics and corroborants are then to be administered, with which may be combined the application of solvent and stimulant plasters, such as the soap plaster, that of cicuta, &c. &c. Often, in these cases, as in the preceding, however assiduous and rational the treatment, the swelling continues to increase; at first, hard and elastic in some places, it soon points, and a fluctuation is felt in it; abscesses burst spontaneously, and their openings degenerate into fistulæ.

Some empirics have been daring enough to irritate the tumour with acrid and stimulating applications, in order to convert the languid swelling into a phlegmon, and afterwards obtain a termination of it either by resolution or suppuration. Fabricius d'Aquapendenté mentions a case of this kind, in which a charlatan enveloped the knee with a sinapism of a very acrid vegetable. An active inflammation took place, which, combated in the ordinary way, terminated by resolution; and the patient recovered the entire use of his knee. But this case cannot serve as a rule; in the greater number of instances in which a similar treatment would be followed, it would infallibly accelerate the progress of the swelling, and caries of the ends of the bones, increase the sufferings, and hasten the death of the patients.

When there are many abscesses about the joint, and the collections of pus are considerable, it is necessary to prevent the stagnation of this fluid, and the absorption of it, by enlarging the fistulous openings, and renewing the dressings repeatedly. It is sometimes useful in these cases to pass a seton in the fistulous passage. This favours the escape of the purulent matter, and impedes the introduction of the air. If the pains be penetrating and excessive, their intensity may be diminished by the external and internal use of sedatives and opiates; but when they are not appeased by these remedies, but become more intolerable, and take away the patient's rest; and when hectic fever, a constant diarrhœa, and colliquative sweats, bring on marasmus, and endanger the patient's life, the amputation of the limb, the last resource in such an invincible disease, must be had recourse to. We must not, however, be in too great a hurry to perform this operation, lest the patient accuse us of precipitance in taking away a limb which might be preserved. Besides, a state of debility is extremely favourable for most surgical operations, and for amputations in particular. It obviates violent inflammation, the troublesome consequence of every operation in which a great number of sensible organs are concerned. However, we do not understand, by state of debility, that state in which the patient is exhausted and harassed by the continuance of the disease, diarrhœa, and colliquative sweats. Bell appears to recommend deferring the operation until this state of exhaustion has taken place. A dangerous precept. If observed, the patient, consumed by marasmus, will be no more able to furnish organic action sufficient for the healing of such a wound as results from amputation.

In order to determine on the necessity or impropriety of this operation, the state of the patient must be attentively examined, the resources of nature considered, and what is to be feared, and what may be hoped for, maturely weighed. If the disease is recent; if no suppuration has yet taken place; if the pains are supportable; and if the patient preserves his plumpness and vigour, the use of the means likely to produce a resolution of the swelling is to be persisted in. It would be contrary to all rule to amputate in this case; for, on the one hand, the violence of the inflammatory symptoms is to be dreaded; and, on the other, the cause of the disease inherent in the solids, and diffused in the fluids, has not yet fixed itself entirely in the joint. We must therefore defer operating until it is firmly established in the articulation; and until, consumed, as it were, by the production of the disease, it is rendered incapable of changing its situation, or taking a new residence in another joint *.

Lastly, the operation is not to be performed but in cases where one joint only is affected; if many articulations, the knee and elbow for instance, are attacked, we must not think of operating. In reality, it is doubtful if death be not preferable to the mutilation that would re-

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* How will the physiologists of this country receive this reasoning? It is evidently founded on the doctrine of the humoral pathologists. It may be asked, what evidence is there, that the cause (in the opinion of the author) so firmly fixed in the solids, and widely diffused in the fluids, abandons its spacious residence to confine itself in a single joint? and why the solids and fluids do not manifest some appearance of its having deserted them?

TRANSLATOR.

sult from such operations; besides, the danger attending them would diminish very much the probability of their success. It is, then, only in affections of the small joints, such as the phalanges, that the different parts can be extirpated. When many of the principal articulations are affected at the same time, and the disease is advanced, death is inevitable.

A practice less terrifying than amputation, inasmuch as it does not deprive the patient of his limb, has been proposed in cases of white swelling. It consists in cutting off, or extirpating, the carious extremities of the bones, when the state of the soft parts admits it.

This operation is practicable only in cases where the affection is confined to the ends of the bones, and extends but very little to the soft parts. If, for instance, the cellular tissue and ligaments about the knee are swelled, and collected into a homogeneous lardy mass, no person would think of performing it. It is, then, confined to cases in which the bones only are affected. In an affection thus limited, which is by no means frequent, the ends of the bones are cut off in this way.

If the head of the humerus be diseased, which is ascertained by an attentive examination of the tumour, and particularly by the introduction of a probe through the fistulæ which communicate with the articulation, the operation is commenced by making on the external and upper part of the arm two longitudinal incisions, directed obliquely downwards, and distant from one another about two inches at their superior part, but approaching as they descend, and uniting in the form of a large V. A triangular flap formed of the skin and deltoid muscle, is preserved in this way. It is dissected and raised upwards by detaching the muscle from the superior and external part of the humerus; it is then committed to an assistant, and the surgeon bringing the elbow forwards and inwards with his left hand, cuts the orbicular ligament of the articulation with his right: the ligament is made tense by the direction given to the arm by this motion of the elbow. The tendons of the subscapularis, infraspinatus, supraspinatus, and teres minor, are to be cut at the same time: this being done, the head of the humerus is easily luxated upwards and outwards, without cutting the tendons of the pectoralis major, latissimus dorsi, and teres major, which has been recommended, but which could not be done without danger of wounding the brachial vessels and nerves. The head of the humerus being thus luxated, the extent of the caries is ascertained; next the glenoid cavity of the scapula is examined, in order to discover if it be affected; a plate of lead or piece of pasteboard is then placed under the head of the humerus to protect the soft parts, and the carious portion of the latter bone is sawed off. During the act of sawing, an assistant prevents the humerus from descending, and at the same time keeps it fixed and motionless.

The circumflex artery is the only vessel to be taken up in this operation; it is found at the posterior and superior part of the triangular flap.

The extirpation of the head of the humerus was first practised by White; the patient recovered in four months, and his arm, shorter by nearly two inches, preserved its shape and strength. Bent of Newcastle, as he relates in the sixty-fourth volume of the *Philosophical Transactions*, performed soon afterwards the same operation. Since this period, many English surgeons say they have performed it. Vigarous of Montpellier has also given a case of it in a memoir presented to the Academy of Surgery in 1774.

Park, a surgeon of Liverpool, conceived and executed the bold project of extending to the articulations of the knee and elbow, the operation performed on the humerus by White. But in these cases, the circumstances are much more unfavourable, and the cutting off the ends of the bones much more difficult. Nevertheless, Park has performed the operation with success, on the knee of a man thirty-three years of age, and of a robust constitution. This surgeon made two parallel incisions along the sides of the patella, which extended to two inches above, and two below this bone; one of the articular arteries was divided and taken up; a transverse incision was made at two inches above the joint, and another at two inches below it; one comprised the half of the thickness of the thigh, the other, half of that of the leg; all the anterior ligaments were cut, and the patella was removed, after which a knife was insinuated behind the femur, to separate the flesh from the bones, to the extent of about four inches. The edge of the knife was kept close to the posterior part of the bones, in order to avoid wounding the popliteal vessels and nerves. The incision behind the bones being thus made, a plate of lead, or a large spatula, was introduced into it, in order to protect the vessels and nerves of the ham from the saw. In this case two inches were cut from the femur, and one inch from the tibia; the bones were then replaced, their ends brought into contact, and the angles of the wound were closed by a few stitches. The disagreeable symptoms that succeeded were numerous and distressing, notwithstanding the relaxed state of the soft parts; however, in about four months the patient was able to walk. The ends of the bones grew together; the knee was turned outwards; the limb, shortened by three inches, supported the weight of the body very well; and the patient could walk without the assistance of crutches.

There are few surgeons intrepid enough to undertake a similar operation. The lesion of the popliteal vessels and nerves, the violence of inflammation, and an abundant suppuration, are the perils to which a patient is exposed, to preserve a limb always deformed, and not more useful than a wooden leg.

The stiffness succeeding to fractures has been for a long time attributed to an effusion of bony matter into the interior, or cellular substance in the vicinity of the joint. This matter, say the ancients and moderns, is a kind of glue which unites more or less completely the ends of the bones, and at the same time indurates the soft parts. This theory, which is found in the treatises of J. L. Petit and Duverney, is abandoned, since the existence of an osseous juice is rejected, and the formation of callus in fractures better understood. Besides, dissections of anchylozed joints have never discovered the osseous concretions, which should result from such supposed effusions. The opinion, that a change, or inspissation, of the synovia, was the most frequent cause of anchylosis, is not better founded. On dissecting a joint in which a complete anchylosis has taken place, the ends of the bones are found united at one point; and in this part the surfaces have lost their natural polish; but the parts which have not formed an adhesion, preserve their polish, and their surfaces are lubricated by a small quantity of synovia, not different from that found in the healthy state.

However various the causes of anchylosis, the mode in which it takes place is always the same:

when desiccated, inflamed, and sometimes even suppurating, as happens in some white swellings with caries of the ends of the bones, grow together; when it is incomplete, that is to say, when it consists of a difficulty of motion in the part, and the impossibility of performing the same motions as in the healthy state, the surfaces of the joint are still contiguous, and the disease exists only in the soft parts surrounding the articulation.

It is essential to distinguish these two species, since the first or true anchylosis is altogether incurable, and is to be considered, in most cases, a happy termination of a grievous disease. The false or incomplete anchylosis is rather a consequence of disease, than a primary affection. When a considerable abscess takes place in the vicinity of a joint, for instance near the wrist or joints of the fingers, the destruction of the cellular substance occasions a stiffness which it is impossible to prevent; but when the tendons exfoliate, the bones to which they are attached remain motionless, and a complete anchylosis inevitably ensues. Therefore, when abscesses form near the joints of the fingers, and when they are followed by exfoliation of the tendons, the fingers should be bent, in order that they may anchyloze in that direction, which is much less inconvenient and much more favourable for the various uses of the hand, than permanent extension. On the contrary, when there is a suspicion that the knee will remain stiff, after the operation for a popliteal aneurism, the leg must be kept as much extended as the pains will permit. The same conduct is to be observed, when, after a spontaneous luxation of the femur, it is perceived that the head of this bone will attach itself to the pelvis, and that the disease will terminate by anchylosis. In these cases, as well as in every other, when the bones are grown together, even though the limb may have a bad and inconvenient direction, it would be imprudent, or even dangerous, to endeavour to destroy the adhesions. In fact, it could not be done without using considerable violence and causing great pain, and would be followed by inflammatory symptoms that would renew the adhesion, or by caries of the bones, which might occasion the death of the patient.

When the false or incomplete anchylosis is apprehended, measures should be taken to prevent it. These consist in moving the affected limb as much as the state of the soft parts will permit. This precaution is much more necessary in affections of the ginglymoidal articulations, than in those of the orbicular, on account of the tendency of the former, from the great extent of their surfaces, the multiplicity of their ligaments, and small extent of motion, to become anchylozed. The exercise of the joint, by extending the contracted soft parts, calls forth their vital properties, and promotes the secretion of the synovia, by causing a friction of the articulating surfaces. A crepitation, arising from the synovia being deficient, is first heard; but as soon as this fluid is secreted in greater quantity, and lubricates the surfaces of the joint, this cracking noise ceases. A certain share of precaution is to be used in moving the limb; the motion, if rudely performed, might cause pain, and induce a swelling and even caries of the ends of the bones. It is by proportioning it to the state of the limb, and increasing daily its extent, as the soft parts yield and grow supple, that good effects can be derived from it. The exercise of the joint is not to be left to the patient himself, neither is it to be confided to ignorant persons, who might think that they moved the anchylozed joint, while the motion took place in the one above it. It is thus that a patient labouring under a stiffness of the elbow, if directed to put that joint frequently in motion, moves the entire upper part of the arm, by making the humerus turn in its articulation with the scapula. If inflammation be excited by these attempts, they must be suspended until the inflammation is subdued, and not recommenced until the pain ceases. We are often obliged to use considerable force in elongating contracted muscles, and it is to the great violence employed in such cases that ignorant bone-setters are often indebted for their success.

The efficacy of the exercise of the joint is increased, and its effects seconded, by warm baths, emollient applications, by frictions with the grease of fowls and other animals, and especially, by pouring warm water on the part, from a very elevated situation. Animal baths and the other means mentioned in the chapter on white swellings, may be also used. When all these means fail, the warm waters of Bourbonne, Barèges, Spa, Bath, and Aix in Savoy, or other warm mineral waters, may be had recourse to. The inconvenience arising from the distance of these mineral waters is now happily removed, as those that are prepared artificially, are found to be fully as effectual as those obtained from the mineral spring itself. Citizen Paul and Company have instituted an establishment for this purpose; and already the waters of Barèges and Loueche, &c. are prepared artificially, and used at this place in the form of baths or pumpings with much success. For this we have the testimony of Dr. Lafisse, inspector of the establishment.

CHAPTER XXII.

OF THE DEVIATIONS OF BONES, AND THE MEANS USED FOR PREVENTING AND CORRECTING THE DEFORMITY ARISING FROM THEM.

THE bones, which give proportions to our different parts, and by which we are maintained in the erect posture, may grow in an unnatural direction; and like the branches of a tree, whose growth is impeded by any cause, may bend under the weight of the body and the action of the muscles, so as to render motion extremely inconvenient. But it is only in infancy, when the tissue of the bones is flexible, and the ossification incomplete, that this vitiated conformation can take place. Affections of this kind are very easily prevented, but are very difficult to remove, and are entirely incurable unless encountered before they have attained a certain degree.*

They are sometimes occasioned by neglect in the clothing and exercise of children; in other cases, they arise from a want of equilibrium in the action of certain antagonist muscles. Thus confining children in swaddling-clothes, the use of stays, premature exercise, and the habit of remaining in bad attitudes, as frequently occasion them as the difference arising primarily in the action and disposition of the muscles.

Physicians had, for a long time, raised their voice against the barbarous use of swaddling-clothes, in which the limbs of the infant were so clogged, and kept in such a state of inactivity, that they could neither grow nor acquire strength; but it remained for the persuasive eloquence of Jean-Jacques to effect a revolution in this part of physical education, which reasoning could not produce *.

Children

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* "All our wisdom consists in servile prejudices; all our "customs are subjugating, painful, and restrictive. Civilized man draws his first breath, and expires in slavery; "at birth, he is laid in swaddling-clothes, when dead he is "nailed down in a coffin. As long as he preserves the "human figure, he is enchained by our institutions. . . . .

"The new-born child has need of stretching himself and "moving his limbs, to shake off that torpor, in which, rolled "up like a ball, he has remained for so long a time. His "limbs are extended, it is true, but confined in such a man-

"ner

Children are, now-a-days, scarcely ever wrapped up in swaddling-clothes: they are generally covered with wide and warm vestments, which protect them from the cold, and at the same time do not prevent the development of their organs.

The use of stays is no less objectionable. The breast and superior part of the abdomen is surrounded with these *cuirasses*, with the view of diminishing their capacity, and giving to the waist a delicacy altogether unnatural, and consequently remote from beauty. But they are not only injurious to beauty alone, their effects are pernicious to health; wide above, and growing narrow downwards, they resemble a cone placed inversely to that formed by the thorax, which is naturally wider at its inferior part than at its summit.

" ner that he cannot move them; his head is tied down by " stay-bands; it would seem to be feared that he should have " the appearance of being alive.

" Thus the impulsion from within, or the tendency of the " internal parts to grow and be developed, meets an insur" mountable opposition. The infant makes continual, but " useless efforts, which exhaust his force, and retard the ac" cession of strength. He was more at his ease, less cramped, " and less compressed in the amnios, than in his new situa" tion; I do not see what he has gained by coming into the " world."

summit. The breast, subjected to continual compression, must become deformed, and have its form changed from conical to oval, or both its extremities made narrower than natural; hence, in consequence of the lateral depression of the ribs, the action of the lungs is impeded, difficulty of respiration brought on, and a remarkable disposition to phthisis pulmonalis induced. However, though the habitual wearing of stays may be attended with these disadvantages, still they are not to be altogether proscribed, as there are certain cases in which they may be used with some advantage.

Let us suppose, for instance, the shoulders of a child to be of a different height, which inequality may be the result of a bad habit, or may be occasioned by the muscles on each side not possessing the same degree of force. If the right shoulder be lower than the left, the child should wear stays in which the notches under the arms are not on a level; that in the right side should not be so deep as that in the left, in order to raise up the right shoulder. By the continued use of this apparatus, the muscles of the left side recover strength enough to balance those of the right, the habit of remaining in a bad attitude is interrupted, and the child

is

[illegible] to its natural shape. It would be in vain to recommend the child to incline to the opposite side, as a force which he could not subdue causes, unknown to him, the deformity. It is necessary that the pressure made by the corset against the arm-pit keep him constantly in mind of making resistance to the depression of the shoulder, by throwing into action the muscles of the opposite side.

The vertebral column, naturally curved by the weight of the body, is liable to many deviations. We have treated of those arising from rickets: we will mention here those only that arise from another cause. Children, from their sight being naturally very weak, or from contracting a habit of stooping their head to inspect substances closely, bend the neck beyond its natural limits; if this habit be neglected, and nothing done to correct it, the bones become indurated in this curved situation, and the head remains always inclined forwards. The same thing happens in the back or loins of young persons of a delicate constitution. The extensor muscles of the trunk, too weak to support the spine, allow it to be preternaturally bent by the weight of the head, thoracic and abdominal viscera. The nature of the person's occupation influences very much the direction in which the curvature takes place. The breast and shoulders are consequently deformed; the former becomes prominent on the side towards which the curvature tends, and is depressed on the opposite side. The use of stays stuffed at the side, opposed to the curvature or prominence of the spine, is then to be recommended; or the machine of Levacher, described in the fourth volume of the Memoirs of the Academy of Surgery, may be used. A vertical piece of iron ascending along the spine, and embracing the back part of the head by two wings reaching to the forehead, and a circular bandage to keep the head extended, are the principal parts of this ingenious machine, repeatedly applied with success by the inventor of it. If the head only is bent forwards, a pasteboard stock very high anteriorly may be worn. Whatever mechanical means are used, they should be applied in such a manner as not to impede in the smallest degree the motion of the affected parts. In fact, it is an essential point to combine exercise with them, which it is known is the best means of re-establishing the strength of the enfeebled muscles. Tonics, cold bathing, friction, a nourishing diet, and, in short, every thing recommended in the treatment of rickets, are to be combined with the use of machines.

If the child be very young, and cannot walk without the assistance of leading-strings, the precaution must be taken of sewing these to a broad girdle, so attached to the child's clothes that it may support the entire body without ascending up under the arm-pits, and thus compressing the axillary nerves and vessels. In general, the use of girdles and leading-strings is injurious; children should be left to themselves, and not forced to walk before their strength admits of it. Premature walking, by making the legs bend under the weight of the body, renders them sometimes bowed; at other times the knees are turned inwards, that is to say, the child is inkneed, and the feet are turned outwards; for the position of the feet is always influenced by that of the knees; thus, when the knees are turned inwards, the feet are turned outwards, and *vice versâ*.

It is important to know this relation necessarily resulting from the disposition of these parts, when we attempt remedying their malconformation. It is on the knowledge of it that is founded the simple but efficacious practice of raising the internal edge of the foot when the knee inclines too much inwards; and of raising, on the contrary, the external edge, when the knee is turned outwards, and the leg bowed.

When a child, from having been put to walk too soon, or from any other cause, shall be inkneed or bow-legged, nothing is to be done in the first case but to have the internal edge of the sole of the shoe made somewhat thicker; and in the second, to have the same done to the external side. The constant adduction and abduction of the foot, if this simple precaution be attended to, influences in time the knee, and insensibly makes it straight. This treatment will be certainly successful if the child be young: his bones, flexible at this time, will yield easily to the force used to straighten them.

There is another species of malconformation, in which the feet are turned entirely either inwards or outwards. Persons labouring under this distortion, to whatever side the sole of the foot is turned, are said to be club-footed. The Romans distinguished two species of this deformity:

mity: they called those *vari* whose feet were turned inwards, and *valgi* those whose feet were turned outwards.

In the first species, the sole of the foot is turned inwards, its internal edge becomes the superior, and its external the inferior; the toes are bent; and the back of the foot, turned outwards, is usually more arched than natural. The contrary circumstances are observed in the second species. In both, the deviation of the foot, when carried to a certain degree, renders progression extremely difficult.

This deformity is occasioned by an inequality in the respective force of the adductors and abductors of the foot; which inequality may depend on the position in which the foetus was placed in the womb, or on the manner in which it has been treated after birth.

Nothing is easier than to discover the affection, even though very inconsiderable; the leg itself is deformed and curved outwards if the sole of the foot is turned inwards, and *vice versâ.* It is of the greatest importance to oppose the deviation of the foot at the moment that it begins to take place. The bones are then soft, cartilaginous, and flexible, and take any form given to them; but as the person advances in age, they become hard, preserve the false position in which they have been drawn, and the part remains for ever deformed.

As the foot is oftener turned inwards than outwards, the most useful apparatus in the greatest number of these cases, consists of a boot or buskin, to the sole of which is attached a spring bent into a semicircle. This boot is to be worn by the patient in such a manner as that the convexity of the same circle may bear against the external part of the leg. The spring thus curved, attached below to the sole of the foot, and above to the external and superior part of the leg by means of a broad knee-band, tends constantly to become straight, presses on the external side of the leg, and at the same time serves to bring the foot outwards. If its use be persisted in from a very early period until the process of ossification is finished, the limb may be brought to its natural direction. But it is impossible to effect this when the treatment has not been commenced early, and before the parts have acquired their entire consistence. In such cases, the patient should wear the boot and spring during his life.

The internal use of tonics should be combined with the application of this apparatus, for frequently these distortions are accompanied with symptoms which indicate a state of cachexy or general debility.

When, in consequence of a burn, a limb remains contracted, the cicatrices must be destroyed, and the limb brought to its proper direction, and kept so by means of a proper apparatus until the wound is healed. If, after an extensive burn of the palm of the hand, the fingers are contracted and kept constantly bent, an incision must be made into the cicatrix, but not deeper than the skin, lest the vessels, nerves, and tendons, so numerous in this part, might be wounded, and the fingers, after being extended, must be attached to a broad piece of board placed on the back of the hand. By this means the wound will heal, while the fingers are kept parallel to the bones of the metacarpus.

A little girl was admitted into the hospital *de la Charité*, with her fingers reverted on the back of her hand in consequence of a burn: the fræna, which confined them, were divided transversely behind the articulation of the first phalanges,

langes, with the bones of the metacarpus: the fingers were brought to their natural direction; and fixed so by means of a board placed on the palm of the hand, and some lint was put between the lips of the wound. Each finger was tied by a little band which passed through the clefts of the board, so that the wounds on the back of the hand might be dressed without deranging the apparatus. A larger cicatrix was formed, and the girl recovered without any deformity.

When cicatrices, in consequence of a burn, gangrenous carbuncle, or any other loss of substance, take place at the anterior part of the neck, the skin is often overstretched, and fræna are formed, which keep the head bent and turned more or less to one side. In such cases, as in every other, the fræna must be cut, the lips of the wound separated and dressed with lint, and the head kept extended during the formation of the new cicatrix. The iron cross of Heister, and in general all the machines proposed for remedying curvatures of the spine, may be employed for preserving the head in its proper direction.

In contractions arising from the continual contracted state of the flexor muscles, it is often useful to contend against the force of these muscles, and bring the limb straight. This direction is the most favourable for the functions of the limbs, even when they are anchylozed.

A young man, in consequence of an abscess which formed in the posterior and inferior part of the thigh, and which was followed by a great loss of the cellular substance of the ham, and of that about the popliteal vessels and nerves, had the biceps cruris, semitendinosus and semimembranosus muscles, so contracted, that the leg formed a right angle with the thigh. The leg could be extended by a force that overcame the contraction, but quickly reassumed the bent state on the removal of the force. Professor Boyer, convinced that in this case it was necessary to contend unceasingly against a power that was always acting, had a machine constructed by Citizen Oudet*, which, by keeping the limb in a constant state of extension, both during rest and exercise, at length overcame the contraction.

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* This ingenious artist, honoured by the approbation of the Academy of Surgery, and esteemed worthy of national rewards, lives in the street des Fossés Saint-Germain-des-Près, Hotel de la Fautrière, Paris. The different apparatus for fractures

tures of the clavicle, neck of the femur, and patella, an engraving and description of which are given in the first volume of this work, have been constructed by him.

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